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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N76-27164*# Houston Univ., Tex.
CARGO TRANSPORTATION BY AIRSHIPS: A SYSTEMS STUDY Final Report
C. J. Huang and Charles Dalton Washington NASA May 1976 196 p refs
(NASA-CR-2636; S-452; JSC-10655) Avail: NTIS HC $7.50 CSCL 01C

A systems engineering study of a lighter than air airship transportation system was conducted. The feasibility of the use of airships in hauling cargo was demonstrated. Social, legal, environmental and political factors were considered as well as the technical factors necessary to design an effective airship transportation system. In order to accomplish an effective airship transportation program two phases of implementation were recommended. Phase I would involve a fleet of rigid airships of 3.5 million cubic feet displacement capable of carrying 25 tons of cargo internal to the helium-filled gas bag. The Phase I fleet would demonstrate the economic and technical feasibility of modern-day airships while providing a training capability for the construction and operation of larger airships. The Phase II portion would be a fleet of rigid airships of 12 million cubic feet displacement capable of carrying a cargo of 100 tons a distance of 2,000 miles at a cruising speed of 60 mph. An economic analysis is given for a variety of missions for both Phase I and Phase II airships. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N76-27165*# General Applied Science Labs., Inc., Westbury, N.Y.
A LINEAR SOLUTION OF LIFT INTERFERENCE IN SQUARE TUNNELS WITH SLOTTED TEST SECTIONS OF FINITE LENGTH
Charles Ruger and Paolo Baronti [1975] 27 p refs
(Contract NAS1-13616)
(NASA-CR-144980) Avail: NTIS HC $4.00 CSCL 01A

A numerical program has been developed to determine the effects on lift interference of the finite length of the slotted portion of a square tunnel. Also analyzed by the program are the effects produced by small variations of static pressure between upper and lower plenum, and by boundary layer development on upper and lower walls downstream of the slotted section. In the flow model, based on compressible linear theory, the wing is represented by a single vortex and the wall induced perturbations are obtained by superimposing the effects of a series of images of the central vortex and of a distribution of sources and sinks on panels along the tunnel walls. The present results can be indicative of the magnitude and of the trends of the interference patterns associated with slotted test sections of finite length at high subsonic Mach numbers. Author

N76-27166*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INVESTIGATION OF TWO BIFURCATED-DUCT INLET SYSTEMS FROM MACH 0 TO 2.0 OVER A WIDE RANGE OF ANGLES OF ATTACK
Eldon A. Latham May 1976 81 p refs
(NASA-TM-X-73118; A-6512) Avail: NTIS HC $5.00 CSCL 01A

A 15.354 percent/scale lightweight fighter type inlet/forebody was tested over a Mach number range of 0 to 2.0. Model configurations consisted of side mounted normal shock and fixed overhead ramp type inlets. Each configuration consisted of two inlets ducted (bifurcated) to supply a single engine face. The normal shock inlet variables included a boundary layer splitter bleed system, alternate boundary layer splitter plates, alternate upper and lower cowl lip shapes, and a blow-in-door (auxiliary inlet) in one lower lip. The only variable of the fixed overhead ramp inlet was the boundary layer bleed flow. Reynolds numbers ranged from 7.6 x 1 million to 19.5 x 1 million/m. Angle of attack ranged from -10 to 35 deg and angle of sideslip from -8 to 8 deg. Test measurements included engine face total pressure recovery, steady state distortion, dynamic distortion, and surface static pressures on the forebody and inlet surfaces. Author

N76-27167*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOZZLE AND WING GEOMETRY EFFECTS ON OTW AERODYNAMIC CHARACTERISTICS
U. VonGlahn and D. Groesbeck 1976 28 p refs Presented at the 12th Propulsion Conf., Palo Alto, Calif., 26-29 Jul. 1976; sponsored by AIAA and SAE
(NASA-TM-X-73420; E-8758) Avail: NTIS HC $4.00 CSCL 01A

The effects of nozzle geometry and wing size on the aerodynamic performance of several 5:1 aspect ratio slot nozzles are presented for over-the-wing (OTW) configurations. Nozzle geometry variables include roof angle, sidewall cutback, and nozzle chordwise location. Wing variables include chord size, and flap deflection. Several external deflectors also were included for comparison. The data indicate that good flow turning may not necessarily provide the best aerodynamic performance. The results suggest that a variable exhaust nozzle geometry offers the best solution for a viable OTW configuration. Author

N76-27168*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC AND ACOUSTIC PERFORMANCE OF A CONTRACTING COWL HIGH THROAT MACH NUMBER INLET INSTALLED ON NASA QUIET ENGINE C
Harry E. Blommer and John W. Schaefer 1976 20 p refs Presented at the 3d Aero-Acoustic Conf., Palo Alto, Calif., 20-23 Jul. 1976; sponsored by AIAA

(NASA-TM-X-73424; E-8762) Avail: NTIS HC $3.50 CSCL 01A

The approach and takeoff performance was evaluated of a contracting cowl variable geometry design inlet installed on a high-bypass-ratio turbofan engine. The design was finalized after consideration of aerodynamic, acoustic, and mechanical factors which would lead to a viable flight worthy concept. The aerodynamic results are presented in terms of inlet recovery and distortion parameter as functions of throat Mach number, and acoustic results in terms of Perceived Noise Level. The contracting cowl high throat Mach number inlet is shown to be an attractive means to reduce forward radiated noise from a high bypass ratio turbofan engine. Author

N76-27169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

WING SHIELDING OF HIGH VELOCITY JET AND SHOCK-ASSOCIATED NOISE WITH COLD AND HOT FLOW JETS

U. VonGlahn, D. Groesbeck, and J. Wagner 1976 22 p refs Presented at 3d Aero-Acoustics Conf., Palo Alto, Calif., 20-23 Jul. 1976; sponsored by AIAA

(NASA-TM-X-73428; E-8771) Avail: NTIS HC $3.50 CSCL 01A

Jet exhaust noise shielding data are presented for cold and hot flows (ambient to 1,100 K) and pressure ratios from 1.7 to 2.75. A nominal 9.5-cm diameter conical nozzle was used with simple shielding surfaces that were varied in length from 28.8 to 114.3 cm. The nozzle was located 8.8 cm above the surfaces. The acoustic data with the various sheilding lengths are compared to each other and to that for the nozzle alone. In general, short shielding surfaces that provided shielding for subsonic jets did not provide as much shielding for jets with shock noise, however, long shielding surfaces did shield shock noise effectively. Author

N76-27170*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WIND TUNNEL INVESTIGATION OF A LARGE-SCALE MODEL OF A LIFT/CRUISE FAN V/STOL AIRCRAFT

Bruno J. Gambucci, Kiyoski Aoyagi, and L. Stewart Rolls May 1976 109 p refs

(NASA-TM-X-73139; A-6619) Avail: NTIS HC $5.50 CSCL 01A

An investigation was conducted in the Ames 40- by 80-Foot wind tunnel to determine the aerodynamic characteristics of a large scale model of a lift/cruise fan V/STOL aircraft. The model was equipped with three fans, one mounted in the forward section of the fuselage in a lift mode, and two mounted on top of the wing adjacent to the fuselage in a lift/cruise mode. The data that were obtained include longitudinal and lateral-directional characteristics of the model, with the horizontal tail on and off, for both the Powered lift and cruise configurations. Powered lift data were obtained at several wind tunnel velocities and at several lift/cruise fan thrust vector angles by varying the position of the hooded deflectors from 0 deg. (the cruise condition) to 90 deg. Author

N76-27171*# Scientific Translation Service, Santa Barbara, Calif.

PRACTICAL AERODYNAMICS OF THE YAK-40 AIRCRAFT

L. Ye. Bogoslavskiy Washington NASA Jun. 1976 225 p Transl. into ENGLISH of the book "Prakticheskaya Aerodinamika Samoleta Yak-40" Moscow, Transport Press, 1975 p 1-153 Revised

(Contract NASw-2791)

(NASA-TT-F-17010) Avail: NTIS HC $7.75 CSCL 01A

The structural and aerodynamic properties of the Yak-40 passenger aircraft and its technical flight characteristics are presented. The problems of flying techniques are discussed and specific recommendations are given for executing flight under various conditions. Information is presented about the equilibrium, stability and controllability, flight in specific situations, flying the aircraft with engine cutout and in turbulent air. Some propositions are also given from the theory of flight, which simplify the study of the problems of practical aerodynamics and flight operation. Author

N76-27172# Weapons Research Establishment, Salisbury (Australia).

STORE SEPARATION FROM AIRCRAFT USING A CAPTIVE TRAJECTORY YAWMETER SYSTEM

E. R. A. Landers, G. J. Simpson, and G. Bishop Oct. 1975 17 p refs

(WRE-TN-1522(WR/D)) Avail: NTIS HC $3.50

A captive trajectory yawmeter system is proposed for the simulation of external store separation from aircraft in a wind tunnel at subsonic and transonic speeds. The important difference between this and other captive trajectory systems is that the store loads are derived from measurements of the flow field and not directly measured. Author

N76-27173# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

FREE STREAM VELOCITY MEASUREMENTS IN A SUPERSONIC IMPULSE FLOW FIELD

Richard C. Jenkins and Wayne L. Konopka May 1976 31 p refs

(RM-618) Avail: NTIS HC $4.00

Measurements of free stream flow velocity were made in a detonation tube facility using a laser anemometer. Velocities were obtained close to the exit plane of a two dimensional nozzle under flow conditions that duplicated a hydrogen-air scramjet engine exhaust. The nozzle exit velocity was predicted by a method of characteristics solution that included real gas effects. The velocity measurements agreed within a few percent with the predicted value (2200 meters/sec). In addition, the velocity was determined of cold gases leaving the nozzle after diaphragm rupture but before ignition of the detonation wave. Measured cold gas velocities agreed closely with ideal gas predictions based on direct expansion of the unburned reactant gases. It is concluded that, with minor modifications of the laser anemometer system, free stream velocities up to about 3000 m/sec can be measured as a function of time in downstream regions of the flow field during routine detonation tube operation. This system could be modified to obtain velocity measurements above 5000 m/sec. Author

N76-27174*# Chrysler Corp., New Orleans, La. Space Div.

LOW SUBSONIC AERODYNAMIC CHARACTERISTICS OF FIVE IRREGULAR PLANFORM WINGS WITH SYSTEMATICALLY VARYING WING FILLET GEOMETRY TESTED IN THE NASA/AMES 12 FOOT PRESSURE TUNNEL (LA65)

J. W. Ball and D. B. Watson Jun. 1976 294 p refs

(Contract NAS9-13247)

(NASA-CR-144600; DMS-DR-2246) Avail: NTIS HC $9.25 CSCL 01A

An experimental and analytical aerodynamic program to develop predesign guides for irregular planform wings (also referred to as cranked leading edge or double delta wings is reported; the benefits are linearization of subsonic lift curve slope to high angles of attack and avoidance of subsonic pitch instabilities at high lift by proper tailoring of the planform-fillet-wing combination while providing the desired hypersonic trim angle and stability. Because subsonic and hypersonic conditions were the two prime areas of concern in the initial application of this program to optimize shuttle orbiter landing and entry characteristics, the study was designated the Subsonic/Hypersonic Irregular Planforms Study (SHIPS). Author

N76-27175*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN EFFICIENT NUMERICAL METHOD FOR SOLVING THE TIME-DEPENDENT COMPRESSIBLE NAVIER-STOKES EQUATIONS AT HIGH REYNOLDS NUMBER

Robert W. MacCormack Jul. 1976 18 p refs

(NASA-TM-X-73129; A-6580) Avail: NTIS HC $3.50 CSCL 20D

A new numerical method used to drastically reduce the computation time required to solve the Navier-Stokes equations at flight Reynolds numbers is described. The new method makes it possible and practical to calculate many important three-dimensional, high Reynolds number flow fields on computers. Author

N76-27176# Sandia Labs., Albuquerque, N.Mex.

FINITE-ELEMENT MODELING OF A PARACHUTE DEPLOYMENT AND INFLATION

W. D. Sundberg 1975 9 p refs Presented at the first Intern. Topical Conf. on Electron Beam Res. and Technol., Albuquerque, N. Mex., 3 Nov. 1975 Sponsored by ERDA
(SAND-75-5744; Conf-751108-4) Avail: NTIS HC $4.00

A finite element model was developed which provides a detailed dynamic model for all points on a conventional parachute during its deployment and inflation. Both canopy and suspension lines are modeled as two-dimensional, flexible, distributed-mass structures. The canopy is assumed to be axisymmetric, and the effect of this assumption is discussed. The change in canopy porosity with material stretch is considered. Aerodynamic forces are included on the suspension lines. The modeling includes line deployment, canopy unfurling, canopy inflation, and disreefing. Emphasis is placed on the types of physical forces included, and the capability and generality allowed by the model. Some simple wave motion comparisons are included. A sample of the required data for parachute deployment modeling is given. Solutions obtained with the model show the tension wave motion which occurs during deployment and early inflation.
Author (ERA)

N76-27177# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

TRANSFORMATION OF RUDDER ANGLES FOR VEHICLES WITH CRUCIFORM WINGS [ZUR TRANSFORMATION VON RUDERWINKELN BEI KREUZFLUEGLERN]

N. Sander and G. Somieski 18 Mar. 1975 16 p refs In GERMAN
(DLR-IB-552-75/11) Avail: NTIS HC $3.50

Methods are described for calculating aerodynamic rudder angles of missiles with four independently controllable cruciform rudders and cruciform wings in the same plane or rotated 45 deg. The calculation of the independent angles from the autopilot command angles can only be realized by adding a secondary condition. The only solution obtained by using three different calculation methods shows that the control of the independent rudders takes place following the principle of minimally induced drag, corresponding to the solution realized in practice. ESA

N76-27178# National Aerospace Lab., Amsterdam (Netherlands). Div. Scientific Services.

EVALUATION OF A POTENTIAL THEORETICAL MODEL OF THE WAKE BEHIND A WING VIA COMPARISON OF MEASUREMENTS AND CALCULATIONS

T. E. Labrujere and O. DeVries 2 Jul. 1974 50 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-74063-U) Avail: NTIS HC $4.00

The validity of the representation of the wake by discrete trailing vortices as common practice in potential theoretical calculations is considered. Theoretical results, obtained with a method developed at NLR, are compared with experimental results obtained at NLR for a 30 deg sweptback wing. The shape of the vortex sheet as well as the velocity distribution downstream from the wing are predicted reasonably well; however, the wake model appears to be not completely satisfactory in the wing tip region. The numerical method requires improvement with respect to the description of the rolling up process of the vortex sheet. Author (ESA)

N76-27179# National Aerospace Lab., Amsterdam (Netherlands). Div. Flight Dynamics.

COMPUTATIONS WITH THE GARABEDIAN AND KORN PROGRAM FOR TWO-DIMENSIONAL TRANSONIC FLOWS WITH EMBEDDED SHOCKS

J. Smith Jul. 1974 36 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-74091-U) Avail: NTIS HC $4.00

Experiences with the Garabedian and Korn program developed for the computation of compressible flows, with or without shocks, about given airfoil profiles and applied to compressible potential flows, with or without shocks (both supercritical shockless flows and flows with shock waves) are described. Its applicability in comparison with exact analytical solutions for supercritical shock-free flows obtained by means of a hodograph method and in comparison with experimental results was investigated. Computations for a number of quasi-elliptical airfoils indicated that the conformal mapping procedure should be handled with care. Supercritical shock-free flows could not be represented correctly. Comparisons between theory and experiment, for cases both with and without shocks, generally showed good qualitative agreement when the suction peak levels from theory and experiment were matched (except for incidences near the design incidence). The computations break down when very strong shocks occur with shock Mach numbers of about 1.5 to 1.6. This, however, is generally beyond the region of practical interest.
Author (ESA)

N76-27180# National Aerospace Lab., Amsterdam (Netherlands). Div. Scientific Services.

FINITE ELEMENT CALCULATION OF AXISYMMETRIC SUBCRITICAL COMPRESSIBLE FLOW

T. E. Labrujere and J. VanDerVooren 26 Nov. 1974 30 p refs
(NLR-TR-74162-U) Avail: NTIS HC $4.00

An iterative finite element calculation is presented of the subcritical compressible flow about a thin parabolic arc of revolution and inside an axisymmetric air intake. The calculations were performed in terms of the stream function as well as in terms of the velocity potential. Both results for the parabolic arc of revolution are compared with finite difference results using transonic small perturbation theory; the agreement is satisfactory and demonstrates the validity of the iterative approach taken. The two different results for the air intake are also in satisfactory mutual agreement. This demonstrates in particular that contrary to the experience with similarly based integral equation methods, the velocity potential finite element approach involves no problems of leakage through solid boundaries in internal flow situations. Consequently, the prospects of doing actual three-dimensional calculations involving internal flow situations using a velocity potential finite element approach are good. Author (ESA)

N76-27181# National Aerospace Lab., Amsterdam (Netherlands). Div. Fluid Dynamics.

TWO-DIMENSIONAL TUNNEL WALL INTERFERENCE FOR MULTI-ELEMENT AEROFOILS IN INCOMPRESSIBLE FLOW

O. DeVries and G. J. L. Schipholt May 1975 10 p refs Presented at the AGARD FDP Symp. on Wind Tunnel Design and Testing Tech., London, 6-10 Oct. 1975
(NLR-MP-75021-U) Avail: NTIS HC $3.50

A singularity method was applied to calculated two-dimensional tunnel wall corrections for multi-element airfoils. The calculations show that the well-known corrections due to Glauert can be applied for a single airfoil, except for the pitching moment correction above 15 deg angle of attack, but that the Glauert approach fails in the case of training edge flap deflections. The results of the calculations agree with the strong nonlinear results previously found for a hinged flat plate at zero incidence.
Author (ESA)

N76-27182# National Aerospace Lab., Amsterdam (Netherlands). Div. Flight Dynamics.

ON THE MOTION OF SHOCK WAVES ON AN AIRFOIL WITH OSCILLATING FLAP

H. Tijdeman 1 Aug. 1975 10 p refs Presented at the IUTAM Symp. Transsonicum II, Goettingen, West Ger., 8-13 Sep. 1975
(NLR-MP-75028-U) Avail: NTIS HC $3.50

To predict unsteady air loads on oscillating wings in transonic flow, an exploratory investigation was performed on a NACA 64A 006 airfoil with an harmonically oscillating flap of 25% of the chord in two-dimensional attached transonic flow. Results are presented of measurements of the periodical motion of the shock waves on this airfoil. Three different types of shock wave propagation are to be distinguished: the sinusoidal shock wave motion, the interrupted shock wave motion, and the upstream propagated shock waves. An analytical model was developed, with which a satisfactory explanation can be given of the observed types of shock wave motion. ESA

N76-27183# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.

ON THE SIMULATION OF AN UNDEREXPANDED PROPULSIVE JET FOR THE INVESTIGATION OF THE STATIC

LONGITUDINAL STABILITY OF AN AXIALLY SYMMETRIC FLIGHT VEHICLE IN SUPERSONIC FLOW

Hans Emunds and Hansgeorg Riedel 15 Mar. 1976 66 p refs In GERMAN; ENGLISH summary Report will also be announced as translation

(DLR-FB-76-21) Avail: NTIS HC $4.50; DFVLR, Cologne DM 25,70

Tests were carried out in a 30 x 30 sq cm supersonic wind tunnel with the aim of verifying whether the jet plume of a propulsive jet can be replaced by a corresponding solid body for wind tunnel investigations concerning the determination of the effect of an underexpanded propulsive jet on the static longitudinal stability of an axisymmetric flight vehicle in supersonic flow. Cold air was used as medium for the direct simulation of the propulsive jet. It was found that for accurate investigations of this kind a solid body jet simulation is justified provided that the influence of the surrounding flow on the contour of the jet plume of the cold air jet is taken into account in designing the solid body jet simulator. Author (ESA)

N76-27184# European Space Agency, Paris (France).

NUMERICAL SOLUTION OF THE STEADY LAMINAR HYPERSONIC BOUNDARY LAYER EQUATIONS AT CHEMICAL NONEQUILIBRIUM

Willi Schoenauer et al Dec. 1975 71 p refs Transl. into ENGLISH of 'Die numerische Loesung der stationaeren laminaren Hyperschall-Grenzschichtgleichungen bei chem. Nichtgleichgewicht', DFVLR, Freiburg i. B. Report DLR-FB-74-71, 6 Nov. 1974 Original German report available from DFVLR, Porz, West Ger. DM 27.30

(ESA-TT-229; DLR-FB-74-71) Avail: NTIS HC $4.50

An implicit finite-difference method is presented for the numerical solution of the steady laminar two-dimensional hypersonic boundary layer equations at chemical nonequilibrium. The strong nonlinearity of the energy equation and of the equations for continuity of the component due to the influence of the chemical reactions necessitates the combination of the Newton iteration method and the method of finite differences. As an example, the boundary layer at an axisymmetric hyperboloid was calculated for Mach number 20 and altitude 30.5 km and for Mach number 18.5 and altitude 50 km, using a five-component model for air. Multi-component diffusion and a binary model for thermodiffusion are taken into account. The results are compared with those computed assuming chemical equilibrium. At 30.5 km there is little difference between the results for equilibrium and nonequilibrium, but at 50 km altitude the differences are significant. Author (ESA)

N76-27185# European Space Agency, Paris (France).

SOLUTION OF THE EULERIAN EQUATIONS FOR THREE-DIMENSIONAL FLOWS AROUND BLUNT BODIES

Claus Weiland Feb. 1976 84 p refs Transl. into ENGLISH of 'Loesung der Euler-Gleichungen fuer raeumliche Ueberschallstroemungen um stumpfe koerper', DFVLR, Cologne Report DLR-FB-75-60, 7 Oct. 1975 Original German report available from DFVLR, Cologne DM 36,10

(ESA-TT-268; DLR-FB-75-60) Avail: NTIS HC $5.00

Flow fields of ideal inviscid gases with freestream Mach numbers larger than unity around blunt bodies are calculated. The integration of the Euler equations is conducted with the difference algorithm developed by Lyubimow and Rusanow. In order to reduce the large computing times which occur particularly for flow fields with transonic freestream Mach numbers, an investigation of the numerical stability is carried out using the method of small oscillations. The result makes it possible to derive a new time step method. Author (ESA)

N76-27186# Dundee Univ. (Scotland). Dept. of Mechanical Engineering.

PARAMETRIC AND NONLINEAR MODE INTERACTION BEHAVIOUR IN THE DYNAMICS OF STRUCTURES Interim Technical Report

A. D. S. Barr and R. P. Ashworth Sep. 1975 26 p

(Grant AF-AFOSR-2723-74; AF Proj. 6813; AF Proj. 9782)

(AD-A020634; AFOSR-76-0003TR) Avail: NTIS CSCL 01/3

The research is concerned with the investigation of the behaviour of structures under internal resonance situations in which periodic excitation of a structure in the vicinity of a natural frequency (external resonance) will excite not only that mode but others having natural frequencies related to that of the excited mode by some integral or near integral relation. In this report two structural configurations are investigated. These show the possibility of interaction in both two and three mode situations. GRA

N76-27187# Lockheed-California Co., Burbank.

ABSTRACTS OF AERODYNAMICS DEPARTMENT COMPUTER PROGRAMS

R. D. Elliott 22 Dec. 1975 59 p Revised

(AD-A020719; LR-26575-Rev-1) Avail: NTIS CSCL 01/1

This report consists of one-page abstracts of active batch processor or computer graphics programs in use by the Calac Aerodynamics Department. The purpose is to inform users and potential users of the availability of the programs, their computing costs, the status of their documentation, and the responsible parties to contact in Aerodynamics and Computer Services, as well as to provide brief descriptions of the programs. GRA

N76-27188# Naval Intelligence Support Center, Washington, D.C. Translation Div.

EXPERIMENTAL STUDY OF VERTICAL APPROACH OF A FLAT PLATE AND INCLINED APPROACH OF A WING TO THE GROUND

Ya. M. Serebriiskii 21 Jan. 1976 18 p refs Transl. into ENGLISH from Tr. Tsentralnyi Aerogidrodinamicheskii Inst. (USSR), no. 422

(AD-A021112; NISC-Trans-3748) Avail: NTIS CSCL 01/1

A description is given of the first experiments in studying the vertical approach of a flat plate and the inclined approach of a wing to a solid surface. The experiments were conducted at TsAGI. The plate and the wing were submerged in water. The time varying forces were measured by means of tensographs incorporated in the rods of a statically determinate frame. GRA

N76-27189# Naval Intelligence Support Center, Washington, D.C. Translation Div.

INFLUENCE OF VISCOSITY ON PROFILE LIFT AND DRAG NEAR A SCREEN

Ya. I. Voitkunskii, Yu. I. Faddeev, and N. A. Poleshchuk 21 Jan. 1976 13 p refs Transl. into ENGLISH from Tr. Korablestroite-nyi Inst., Leningrad (USSR), no. 65, 1969 p 43-48

(AD-A021184; NISC-Trans-3756) Avail: NTIS CSCL 01/1

A screen has a great influence on the pressure distribution over the surface of an aerodynamic profile in comparison with profile motion in an unbounded fluid. Because of this, the viscous drag of a wing moving above a screen may change markedly. GRA

N76-27190# Boeing Vertol Co., Philadelphia, Pa.

VALIDATION OF ROTORCRAFT FLIGHT SIMULATION PROGRAM THROUGH CORRELATION WITH FLIGHT DATA FOR SOFT-IN-PLANE HINGELESS ROTORS Final Report, Jun. 1974 - Jul. 1975

James A. Staley Jan. 1976 179 p refs

(Contract DAAJ02-74-C-0051; DA Proj. 1F2-62208-AH-90)

(AD-A021176; D210-10975-1; USAAMRDL-TR-75-50) Avail: NTIS CSCL 01/1

A study was conducted to evaluate the 300,000-byte version of the C-81 AGAJ74 helicopter simulation program's capability for prediction of performance, rotor dynamic loads, and stability for soft-in-plane hingeless rotor helicopters. Available test data were compiled for the BO-105 single-rotor helicopter to provide a basis for evaluation of computer program analytical results. Results indicated good correlation for trim and performance, and reasonable correlation for main rotor alternating flap bending moments. Poorer correlation was obtained for main rotor chord and shaft bending moments. Poor agreement was obtained for response to control inputs in hover and at 100 knots; this may have been due to selection of too large a numerical integration interval. Approximately the same damping was indicated by test and analysis for aeroelastic stability. Attempts to compare C-81 results for control power and stability derivatives with analytical results from Boeing Vertol's Y-92 computer program were not successful. Significant differences were attributed to restraint of blade flapping in C-81 during these computations. Author (GRA)

N76-27191# United Technologies Research Center, East Hartford, Conn.
ROTORCRAFT WAKE ANALYSIS FOR THE PREDICTION OF INDUCED VELOCITIES Final Report, Feb. 1974 - Oct. 1975
Anton J. Landgrebe and T. Alan Egolf Jan. 1976 173 p
(Contract DAAJ02-74-C-0027; DA Proj. 1F2-62209-AH-76)
(AD-A021202; R75-911852-18; USAAMRDL-TR-75-45) Avail: NTIS CSCL 01/1.

A rotorcraft wake analysis for computing flow velocities induced by the rotors and wing of a helicopter is described, and predicted induced velocities are compared with experimental data from many sources. Combined in a single computerized analysis are the capabilities for calculating three components of time-averaged and instantaneous induced velocities on or off the rotor(s) of single-rotor, dual-rotor, and winged helicopter configurations in hovering and forward flight. GRA

N76-27192# Sikorsky Aircraft, Stratford, Conn.
A METHOD FOR PREDICTING HELICOPTER HUB DRAG Final Report
Thomas W. Sheehy and David R. Clark Jan. 1976 110 p refs
(Contract DAAJ02-74-C-0050; DA Proj. 1F2-62204-AH-87)
(AD-A021201; SER-50945; USAAMRDL-TR-75-48) Avail: NTIS CSCL 01/1

A procedure has been developed to determine the contribution of the rotor hub to the total helicopter drag. The method developed uses a three-dimensional potential flow analysis to determine the flow environment in which the hub operates combined with empirical data in order to predict the drag of the hub and its associated interference drag. Predictions using the method are in good agreement with test data for unfaired and faired rotor hubs. A review of available rotor hub drag test data was conducted in order to identify the factors affecting helicopter rotor hub drag. The data base established was used in the development of the hub drag prediction method and also to define a systematic wind tunnel test program to refine and verify the drag prediction method and to investigate in detail the parameters affecting the drag contribution of the rotor hub. GRA

N76-27193# Sikorsky Aircraft, Stratford, Conn. Sikorsky Aircraft Div.
AEROELASTIC ROTOR STABILITY ANALYSIS Final Report
Robert A. Johnston and S. J. Cassarino Jan. 1976 201 p
(Contract DAAJ02-74-C-0010; DA Proj. 1F2-62208-AH-90)
(AD-A020871; USAAMRDL-TR-75-40) Avail: NTIS CSCL 01/3

This report describes an aeroelastic analysis that provides a complete description of the dynamics and aerodynamics of fully coupled helicopter main or tail rotor/airframe/control systems. The analysis is designed to study stability characteristics in conditions of pure axial flow or in forward flight, for which it computes the system's eigenvalues and eigenvectors. For hover studies, the aerodynamic derivatives include stall and compressibility effects, and circulatory and noncirculatory unsteady effects are accounted for through use of Theodorsen and Loewy type lift deficiency functions. The forward-flight aerodynamic derivatives are obtained from any appropriate linear or nonlinear time history analysis. The approximations made in the forward-flight analysis limit such applications to an advance ratio of about 0.5. GRA

N76-27194# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
FLOW VISUALIZATION INVESTIGATION OF THE EFFECTS OF THE INITIAL BOUNDARY LAYER ON JET MIXING
William G. Hill, Jr. Jan. 1976 18 p refs
(AD-A020509; RM-612) Avail: NTIS CSCL 20/4

A series of spark schlieren photographs has been obtained for the initial mixing regions of both two dimensional and axisymmetric low speed jets. A large scale orderly structure was clearly present in the turbulent mixing when the initial boundary layer was laminar. When the boundary layer was tripped, the large scale structure appeared to be destroyed. Author (GRA)

N76-27195# United Technologies Research Center, East Hartford, Conn.
SOLUTION OF THE MULTIDIMENSIONAL COMPRESSIBLE NAVIER-STOKES EQUATIONS BY A GENERALIZED IMPLICIT METHOD Final Report, Mar. 1972 - Dec. 1975
W. R. Briley, H. McDonald, and H. J. Gibeling Jan. 1976 63 p refs
(Contract N00014-72-C-0183; NR Proj. 061-202)
(AD-A020554; R76-911363-15) Avail: NTIS CSCL 20/4

In an effort to exploit the favorable stability properties of implicit methods and thereby increase computational efficiency by taking large time steps, an implicit finite-difference method for the multidimensional Navier-Stokes equations is presented. The method consists of a generalized implicit scheme which has been linearized by Taylor expansion about the solution at the known time level to produce a set of coupled linear difference equations which are valid for a given time step. To solve these difference equations, the Douglas-Gunn procedure for generating alternating-direction implicit (ADI) schemes as perturbations of fundamental implicit difference schemes is employed. The resulting sequence of narrow block-banded systems can be solved efficiently by standard block-elimination methods. The method is a one-step method, as opposed to a predictor-corrector method, and requires no iteration to compute the solution for a single time step. The use of both second and fourth order spatial differencing is discussed. Test calculations are presented for a three-dimensional application to subsonic flow in a straight duct with rectangular cross section. GRA

N76-27196# Naval Surface Weapons Center, White Oak, Md.
INDUCED SIDE FORCES ON BODIES OF REVOLUTION AT HIGH ANGLE OF ATTACK
Andrew B. Wardlaw and Alfred M. Morrison 1 Nov. 1975 40 p refs
(AD-A020356; NSWC/WOL/TR-75-176) Avail: NTIS CSCL 20/4

Linear regression techniques are used to establish a quantitive description of side forces on bodies at high incidence. A data base is assembled concerning the key side force characteristics of maximum observed side force, angle of occurrence, and minimum angle of attack at which a side force is observed. This information is examined to determine the important trends and a predictive model for side force based on the cossflow analogy is developed to suggest other important variables. A linear regression model for these quantities is developed to include only those variables which are statistically significant. GRA

N76-27197# Stanford Univ., Calif. Thermosciences Div.
THE TURBULENT BOUNDARY LAYER ON A ROUGH, POROUS PLATE: EXPERIMENTAL HEAT TRANSFER WITH UNIFORM BLOWING
J. M. Healzer, R. J. Moffat, and W. M. Kays May 1974 182 p refs
(Contracts N00123-71-C-0372; N00014-67-A-0112-0072)
(AD-A020530; SU-HMT-18) Avail: NTIS CSCL 20/4

Stanton number measurements have been made for a transpired turbulent boundary layer on a rough surface. Tests were conducted at uniform blowing fractions from 0 to .008, with uniform surface temperature and uniform free-stream velocity. The X-Reynolds number range of these tests was from 100,000 to 10 to the 7th power and the roughness Reynolds number range from 20 to 200. The data are believed to be accurate to within + or - .0001 Stanton number units over most of this range. At each test condition, several velocity profiles were taken to measure the boundary layer growth. The boundary layer momentum thickness variation along the test surface has been used to estimate rough-plate skin friction. The data indicate the expected increase in both skin friction and heat transfer due to roughness. The data display some unusual features when plotted against boundary layer size. GRA

N76-27198# General Dynamics/Convair, San Diego, Calif.
AIRFOIL OPTIMIZATION THROUGH THE ADAPTIVE CONTROL OF CAMBER AND THICKNESS. PHASE 2 TRANSONIC WIND TUNNEL TEST AND PROGRAM SUMMARY Final Technical Report, 15 Dec. 1973 - 30 Sep. 1975
E. S. Levinsky, R. H. Schappelle, and S. Pountney Sep. 1975 112 p refs
(Contract N00014-74-C-0127; NR Proj. 212-224)

(AD-A020326; CASD-NSC-75-004) Avail: NTIS CSCL 01/3

A new interactive wind tunnel technique for optimizing airfoil shape has been demonstrated satisfactorily under both low speed and transonic flow conditions. The transonic program reported herein, was conducted in the two-dimensional section of the General Dynamics High Speed Tunnel (GHOST) of below-down type at a nominal Mach number of 0.75. The program utilized a flexible airfoil model whose shape could be conformally varied during a run (of approximately one minute duration) by means of five pair of hydraulic actuators. The airfoil shape and angle of attack were controlled by a link-up of three analog and digital computers which analyzed the wind tunnel balance data on-line and adjusted the airfoil shape and angle of attack to optimize a given merit function. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N76-27199# Committee on the Judiciary (U. S. Senate).
OVERSIGHT OF CIVIL AERONAUTICS BOARD PRACTICES AND PROCEDURES, VOLUME 3
Washington GPO 1975 803 p refs Hearings before subcomm. on Admininstrative Practice and Procedure of Comm. on the Judiciary, 94th Congr., 1st Sess., 6, 14, 18-19, 25-26 Feb.; 4 and 21 Mar. 1975
(GPO-51-146) Avail: Subcomm. on Administrative Practice and Procedure

The Civil Aeronautics Board's statutory authority to exempt airline agreements from the reach of the antitrust laws is examined. Emphasis is placed on the capacity reduction agreements, in which certain carriers have agreed to reduce service along certain routes. The effects of these agreements on airline pilots is discussed. J.M.S.

N76-27200# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF FATAL ACCIDENTS INVOLVING WEATHER AS A CAUSE/FACTOR: US GENERAL AVIATION 1974
15 Dec. 1975 323 p
(PB-250037/9; NTSB-AMM-75-16) Avail: NTIS HC $9.75 CSCL 01B

All fatal U.S. general aviation accidents involving weather as a cause/factor for the year 1974 are reported. This format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated on all accidents involving weather as a cause/factor by type of accident, phase of operation, injury index, aircraft damage, pilots certificate, injuries and cause/factor(s). The publication is published annually. GRA

N76-27201# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF ACCIDENTS INVOLVING ROTORCRAFT, U.S. GENERAL AVIATION, 1974
15 Dec. 1975 164 p
(PB-250038/7; NTSB-AMM-75-15) Avail: NTIS HC $6.75 CSCL 01B

U.S. general aviation rotorcraft accidents occurring in 1974 are reported. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries and causal factor(s). GRA

N76-27202# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
LISTING OF AIRCRAFT ACCIDENTS/INCIDENTS BY MAKE AND MODEL, U.S. CIVIL AVIATION, 1974
15 Dec. 1975 181 p
(PB-250039/5; NTSB-AMM-75-12) Avail: NTIS HC $7.50 CSCL 01B

All U.S. civil aviation accidents/incidents occurring in calendar year 1974, sorted by aircraft make and model are listed. Included are the file number, aircraft registration number, date and location of the accident, aircraft make and model and injury index for all 4,600 accidents/incidents occurring this period. GRA

N76-27203# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF ACCIDENTS INVOLVING CORPORATE/EXECUTIVE AIRCRAFT, U.S. GENERAL AVIATION 1974
15 Dec. 1975 57 p
(PB-249984/6; NTSB-AMM-75-19) Avail: NTIS HC $4.50 CSCL 01B

U.S. general aviation corporate/executive aircraft accidents occurring in 1974 are reported. Included are 78 accident briefs, 15 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injuries and causal/factor(s). This publication is published annually. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N76-27204# Committee on Science and Technology (U. S. House).
R AND D PORTIONS OF THE AIRPORT AND AIRWAY DEVELOPMENT ACT OF 1975
Washington GPO 1975 247 p refs Hearings before Subcomm. on Aviation and Transportation R and D of Comm. on Sci. and Technol., 94th Congr., 1st Sess., No. 23, 12 and 15 May 1975
(GPO-56-322) Avail: Subcomm. on Aviation and Transportation R and D

The FAA's fiscal year 1976 budget authorization request in the area of aeronautical research and development is considered. Coordination of research activity within the aviation industry, funding from the Aviation Trust Fund, and airport pavement research and development programs are among the topics discussed. J.M.S.

N76-27205# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugbahnvermessung und Navigation.
FAILURE ANALYSIS FOR A SPACE FIXED, A TANGENTIAL, AND A LOCALLY VERTICAL INERTIAL NAVIGATION SYSTEM [FEHLERANALYSE FUER EIN RAUMFESTES, EIN TANGENTIALES UND EIN OERTLICH VERTIKALES TRAEGHEITSNAVIGATIONSSYSTEM]
H. Winter and N. Fuerstenau (Tech. Univ. Darmstadt, West Ger.) Apr. 1975 32 p refs In GERMAN
(DLR-IB-153-75/15) Avail: NTIS HC $4.00

An error analysis was carried out for three types of inertial navigation systems: the space-fixed system, for which the stabilized element is stabilized with respect to the inertial space; the tangential system, for which the stabilized element is stabilized with respect to the earth; and the locally vertical system, for which the stabilized element remains parallel to the local perpendicular and to the north and east direction. Aircraft velocity and position are determined for the three systems in the coordinate system coinciding theoretically with the axis of the stabilized element. The navigation equations used for error analysis do not take into account the flattening of the earth. ESA

N76-27206# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
APPLICATION OF OPTIMAL SMOOTHING TECHNIQUES

TO NAVIGATION PROBLEMS [DIE ANWENDUNG OPTIMALER GLAETTUNGSTECHNIKEN BEI NAVIGATIONSPROBLEMEN]
H. Winter Jun. 1975 20 p refs In GERMAN
(DLR-IB-153-75/24) Avail: NTIS HC $3.50

An optimal smoothing algorithm, consisting of a forward Kalman filter and a backward filter, producing smoothed estimated values, is described for hybrid navigation. The method is compared with the classical least squares method and is the Kalman filter and is demonstrated by two examples concerning Doppler radar with Tacan support, and velocity reference by radar measurement smoothed by inertial navigation. ESA

N76-27207# European Space Agency, Paris (France).
SPACE SEGMENT OF THE AEROSAT SYSTEM [LE SYSTEME AEROSAT - SEGMENT SPATIAL]
A. Pinglier 1975 31 p In FRENCH Presented at the UIT Conf., Le Bourget, France, 6 Jun. 1975
Avail: NTIS HC $4.00

The space segment of the Aerosat aeronautical satellite system for aircraft communication and position determination above the Atlantic Ocean is described. This segment provides communication channels for exchange of information between ground users and aircraft. It consists of two geostationary satellites. Functionally, the ground installations controlling the satellites belong to this segment and consist of a control station situated in Europe and a small number of electronic test sets permitting checks of the overall system functions. ESA

N76-27208# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PHASE DERIVED CLOSE RANGE NAVIGATION AND ATTITUDE-SENSING Physical Sciences Research Papers
Uve H. W. Lammers 22 Sep. 1975 41 p
(AF Proj. 8682)
(AD-A020294; AFCRL-PSRP-642; AFCRL-TR-75-0498) Avail: NTIS CSCL 01/4

An electronic aid that could substitute for perspective vision under adverse weather conditions would provide a major safety improvement in aircraft guidance for landing. To develop such a system, phase-derived techniques for locating the angular and radial position of microwave beacon transmitters have been investigated. Position parameters are derived from phase measurements by individual and interferometric receivers, both stationary and in motion. The error sensitivity of the various techniques is evaluated for a geometry typical of a landing aircraft. Author (GRA)

N76-27209# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE NETHERLANDS PROPOSES THE LARGO
5 Jan. 1976 6 p refs Transl. into ENGLISH from Aviation Intern. (France), no. 670, 1975 p 57
(AD-A020462; FTD-ID(RS)I-2496-75) Avail: NTIS CSCL 17/7

The Netherlands proposes a new system of controlling civil air traffic, known temporarily as 'Largo'. According to the terms used during a press conference, the 'Largo' is a modular mini-system which relies in particular on a computer with duplicate programs to avoid conflicts of traffic when proposing the most adequate solutions to the controller, when computing the ideal time for each take-off, during the exchange of radar information with other centers, etc. The system is based on using LAR-II radar which usefully sweeps the air space between 1000 m and 370 km up to an altitude of 120,000 feet and which has an antenna rotation rate which can be set betweeb 6 and 12 rpm. Considering its fundamental characteristics, the same radar thus makes it possible to control distant zones at the same time as it controls the terminal of an airport. GRA

N76-27210# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala.
BANG-BANG SEEKER MODEL AND MODEL REDUCTION FOR DIGITAL SIMULATION
R. E. Yates and R. P. Wasky 5 Nov. 1975 41 p refs
(DA Proj. 1M2-63310-D-074)
(AD-A020737; RG-76-31) Avail: NTIS CSCL 17/7

Four computer programs are presented for the analysis of a sampled data terminal homing missile seeker. A Runge-Kutta program is given for the solution of a general dynamical system. Two convenience programs for obtaining the products of a system of polynomials and a line printer plot routine are included. A program, using methods developed by Chen and Shieh, for obtaining a reduced order model from a higher order system is also presented. The programs are illustrated via the study of a Wide Field-of-View (WFOV) laser guided semi-active terminal seeker. Author (GRA)

N76-27211# Mitre Corp., McLean, Va.
AUTOMATED IFR TRAFFIC CONTROL: PROJECT OVERVIEW AND OBJECTIVES
R. A. Rucker Nov. 1975 78 p refs
(Contract DOT-FA70WA-2448)
(AD-A020351; MTR-7073; FAA-EM-75-10) Avail: NTIS CSCL 17/7

A digital computer simulation of the automated control of IFR traffic through a realistic replica of an en route arrival sector is described, along with the current plans for improving that model. The simulation is currently capable of automatically planning conflict-free clearances using altitude restrictions and assignments, updating that plan based on flight progress, and issuing the planned clearances at the proper time to assure that minimum separation standards are not violated. The objective is to experimentally develop the technical means for, and the operational and economic implications of, automating the more routine IFR traffic control tasks while assuring that the human controller can retain full cognizance and managerial control of the situation. GRA

N76-27212# Naval Electronics Lab. Center, San Diego, Calif.
COVARIANCE ANALYSIS OF THE DD 963 NAVIGATION SYSTEM Research and Development Report, 1 Jan. - 17 Nov. 1975
Jeffrey M. Nash 17 Nov. 1975 113 p refs
(NELC Proj. A117; NELC Proj. N711)
(AD-A021114; NELC-TR-1967) Avail: NTIS CSCL 17/7

A detailed covariance analysis of the DD 963 navigation system is performed. A fully documented, 26-state model of the navigation system environment and sensor errors is developed. Multisensor, integrated navigation using an EM log, ship's gyro, Omega navigation receiver, and NNSS satellite is analyzed. Two primary systems are defined which yield suboptimal, 'best' performance, depending on the sensor system environment. Use of the recommended systems results in significantly improved navigation accuracy. Curves and tables provide detailed summaries of system performance according to a designated baseline scenario and several off-nominal variations as well. GRA

N76-27856 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
MAP DISPLAYS
R. M. Taylor *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p refs (For availability see N76-27846 18-52)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N76-27213*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC CHARACTERISTICS OF A POWERED TILT-PROPROTOR WIND TUNNEL MODEL
John C. Wilson, Raymond E. Mineck, and Carl E. Freeman Mar. 1976 273 p refs
(NASA-TM-X-72818) Avail: NTIS HC $9.00 CSCL 01C

An investigation was conducted in the Langley V/STOL tunnel to determine the performance, stability and control, and rotor-wake interaction effects of a powered tilt-proprotor aircraft model with gimbal-hub rotors. Tests were conducted at representative flight

conditions for hover, helicopter, transition, and airplane flight. Force and moment data were obtained for the complete model and for each of the two rotors. In addition to wind-speed variation, the angle of attack, angle of sideslip, rotor speed, rotor collective pitch, longitudinal cyclic pitch, rotor pylon angle, and configuration geometry were varied. The results, presented in graphical form, are available in tabular form to facilitate the validation of analytical methods of defining the aerodynamic characteristics of tilt-proprotor configurations. Author

N76-27214*# Grumman Aerospace Corp., Bethpage, N.Y.
CORRELATION STUDY OF THEORETICAL AND EXPERIMENTAL RESULTS FOR SPIN TESTS OF A 1/10 SCALE RADIO CONTROL MODEL
William Bihrle, Jr. Jul. 1976 155 p refs
(Contract NAS1-13578)
(NASA-CR-144995) Avail: NTIS HC $6.75 CSCL 01C

A correlation study was conducted to determine the ability of current analytical spin prediction techniques to predict the flight motions of a current fighter airplane configuration during the spin entry, the developed spin, and the spin recovery motions. The airplane math model used aerodynamics measured on an exact replica of the flight test model using conventional static and forced-oscillation wind-tunnel test techniques and a recently developed rotation-balance test apparatus capable of measuring aerodynamics under steady spinning conditions. An attempt was made to predict the flight motions measured during stall/spin flight testing of an unpowered, radio-controlled model designed to be a 1/10 scale, dynamically-scaled model of a current fighter configuration. Comparison of the predicted and measured flight motions show that while the post-stall and spin entry motions were not well-predicted, the developed spinning motion (a steady flat spin) and the initial phases of the spin recovery motion are reasonably well predicted. Author

N76-27215*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRELIMINARY ANALYSIS OF LONG-RANGE AIRCRAFT DESIGNS FOR FUTURE HEAVY AIRLIFT MISSIONS
Walter P. Nelms, Jr., Ronald Murphy (AFFDL), and Alice Barlow (Computer Sciences Corp., Mountain View, Calif.) Jun. 1976 114 p refs
(NASA-TM-X-73131) Avail: NTIS HC $5.50 CSCL 01C

A computerized design study of very large cargo aircraft for the future heavy airlift mission was conducted using the Aircraft Synthesis program (ACSYNT). The study was requested by the Air Force under an agreement whereby Ames provides computerized design support to the Air Force Flight Dynamics Laboratory. This effort is part of an overall Air Force program to study advanced technology large aircraft systems. Included in the Air Force large aircraft program are investigations of missions such as heavy airlift, airborne missile launch, battle platform, command and control, and aerial tanker. The Ames studies concentrated on large cargo aircraft of conventional design with payloads from 250,000 to 350,000 lb. Range missions up to 6500 n.mi. and radius missions up to 3600 n.mi. have been considered. Takeoff and landing distances between 7,000 and 10,000 ft are important constraints on the configuration concepts. The results indicate that a configuration employing conventional technology in all disciplinary areas weighs approximately 2 million pounds to accomplish either a 6500-n.mi. range mission or a 3600-n.mi. radius mission with a 350,000-lb payload. Author

N76-27216*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FRICTION CHARACTERISTICS OF 20 X 4.4, TYPE 7, AIRCRAFT TIRES CONSTRUCTED WITH DIFFERENT TREAD RUBBER COMPOUNDS
Robert C. Dreher and Thomas J. Yager Washington NASA Jul. 1976 28 p refs
(NASA-TN-D-8252; L-10825) Avail: NTIS HC $4.00 CSCL 14D

A test program was conducted at the Langley aircraft landing loads and traction facility to evaluate the friction characteristics of 20 x 4.4, type, aircraft tires constructed with experimental cut-resistant, tread rubber compounds. These compounds consisted of different blends of natural rubber (NR) and an alfin catalyzed styrene-butadiene copolymer rubber (SBR). One tire having a blend of 30 SBR and 70 NR and another having a blend of 60 SBR and 40 NR in the tread were tested together with a standard production tire with no SBR content in the tread rubber. The results of this investigation indicated that the test tires constructed with the special cut-resistant tread rubber compositions did not suffer any significant degradation in tire friction capability when compared with the standard tire. In general, tire friction capability decreased with increasing speed and surface wetness condition. As yaw angle increased, tire braking capability decreased while tire cornering capability increased. Tread-wear data based on number of brake cycles, however, suggested that the tires with alfin SBR blends experienced significantly greater wear than the standard production tire. Author

N76-27217# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN AMPHIBIAN BUILT BY RUSSIAN STUDENTS
W. Cejtlin and W. Jagniuk 22 Jan. 1976 10 p refs Transl. into ENGLISH from Skrzydlata Polska (Poland), v. 8, no. 38, 8 p
(AD-A020349; FTD-ID(RS)I-0039-76) Avail: NTIS CSCL 01/3

The development of the amphibian was divided into two stages. In the first stage it was decided to construct and test the flying boat the second stage was to detect shortcomings revealed in the trial test and to develop and build on a wheeled landing gear. GRA

N76-27218# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DECISION MAKING WITHIN THE ADVANCED TANKER/CARGO AIRCRAFT PROGRAM M.S. Thesis
David H. MacLeod Dec. 1975 88 p refs
(AD-A020360; GSM/SM/75D-18) Avail: NTIS CSCL 01/2

The concept of air refueling has been proven to be of enormous benefit to the capability of the Air Force. Requirements for air refueling resources have been steadily increasing as a result of improving enemy defenses and changing tactics of U. S. Forces. The most recent added burden is the requirement to refuel strategic airlift forces if the use of enroute air fields is denied. This requirement provides the impetus for the development of the Advanced Tanker/Cargo Aircraft (ATCA). The thesis investigates the problematical environment surrounding the ATCA program. GRA

N76-27219# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FEASIBILITY OF USING THE COMPASS COPE REMOTELY PILOTED VEHICLE FOR HIGH ALTITUDE WEATHER RECONNAISSANCE M.S. Thesis
Larry B. Downes Dec. 1975 108 p refs
(AD-A020357; GSM/SM/75D-14) Avail: NTIS CSCL 01/3

This is a study of feasibility of using Compass Cope RPV'S to perform aerial weather reconnaissance missions. The mission is defined in terms of vehicle performance and meteorological measurement requirements. The Compass Cope RPV is studied for performance. The availability of meteorological sensing equipment is reviewed for compatibility with the Compass Copellite relay. Brief cost comparisons are made. GRA

N76-27220# Naval Intelligence Support Center, Washington, D.C. Translation Div.
THE KAG-3 WIG AND ITS TRIALS
G. G. Filipchenko 7 Jan. 1976 7 p Transl. into ENGLISH from Katera i Yakhty (USSR), no. 15, 1968 p 21-22
(AD-A021182; NISC-Trans-3737) Avail: NTIS CSCL 01/3

The creation of the WIG is the result of many years of research and studies both in the field of developing more cost effective air cushion vehicles and in the field of improving flying boats. As an example of a flying aerofoil the report examines the KAG-3 WIG built by the Japanese firm Kawasaki. GRA

N76-27221# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
AN ANALYTICAL INVESTIGATION OF THE EFFECTS OF INCREASED INSTALLED HORSEPOWER ON HELICOPTER AGILITY IN THE NAP-OF-THE-EARTH ENVIRONMENT

Donald J. Merkley Dec. 1975 30 p
(DA Proj. 1F2-62209-AH-76)
(AD-A020924; USAAMRDL-TN-21) Avail: NTIS CSCL 01/3

This report describes an investigation of the effects of increased horsepower on the agility of a helicopter in nap-of-the-earth (NOE) maneuvers. A computer program, the Maneuver Criteria Evaluation Program, was used to simulate the flight of a representative scout-type helicopter, the OH-58. Calculations were made for both the standard OH-58 and an OH-58 with increased installed power. The increased installed power had significant effects on the agility of the helicopter in evasive-acceleration type maneuvers. GRA

N76-27222# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
RELIABILITY EFFECTS ON MULTI-MISSION RPV MAINTENANCE M.S. Thesis
Michael J. Weppner Sep. 1975 145 p refs
(AD-A020371; GOR/SM/75D-13) Avail: NTIS CSCL 01/3

A computer simulation model of Multi-Mission RPV maintenance, recently developed for the RPV System Program Office at Wright-Patterson AFB, was expanded and refined, and used to investigate the relative effects of reliability on the MMRPV maintenance function. Avionics reliability was varied by the application of 'stress factors' to engineering estimates of failure rates. Total system reliability, or the probability of an RPV surviving launch, flight, and recovery, was considered over a range from 0.96 to 0.80. GRA

N76-27223# Lockheed-Georgia Co., Marietta.
FEASIBILITY STUDY OF C-141A FUEL CONSERVATION THROUGH AFT C. G. OPERATIONS Final Report, Jun. - Dec. 1975
James R. Peele Dec. 1975 134 p refs
(Contract F33615-75-C-3155; AF Proj. 1207)
(AD-A021079; LG75ER0121; AFFDL-TR-75-140) Avail: NTIS CSCL 01/3

This report is a feasibility study of the potential fuel savings resulting from the operation of the C-141 aircraft loaded and flown in a more aft c.g. condition than has been practiced in past operations. The study included a survey of actual operations at Charleston and Travis Air Force Bases, a review of C-141 aircraft loading histories taken from Weight and Balance Clearance Form F data, and analyses of changes in cruise drag, handling qualities and flight controls, fuel management sequencing, and service life associated with the operation of the C-141 aircraft at the most-aft, currently-authorized c.g. position and beyond this position. Results are presented in terms of c.g. operational limits and associated fuel/cost savings. GRA

N76-27224# Naval Ship Research and Development Center, Bethesda, Md.
INVESTIGATION OF TECHNIQUES FOR TOWING A HH-3F HELICOPTER AT SEA
Raymond P. Para and John V. Mirabella Dec. 1975 19 p
Sponsored in part by Coast Guard
(AD-A021133; SPD-653-01) Avail: NTIS CSCL 01/3

A U.S. Coast Guard HH-3F helicopter downed at sea overturned while being towed back to port. This incident indicated a need for adequate towing techniques. A project was undertaken for the U.S. Coast Guard to develop techniques for towing this type helicopter at sea. A model of the helicopter with a scale ratio of 6.67 was constructed and towed in the model basins. Towing was conducted in calm water and in waves simulating up to Sea State 5. The helicopter towing was unstable under most conditions but was stabilized by attaching a drogue parachute to the helicopter. The addition of the drogue parachute is the primary recommendation made for towing the helicopter at sea. GRA

N76-27225# Teledyne/McCormick Selph, Hollister, Calif.
DEVELOPMENT OF A BACKUP COVER FOR THE AH-1 CANOPY REMOVAL SYSTEM Final Report, 12 May - 31 Oct. 1975
Donald R. Duffy 31 Oct. 1975 36 p
(Contract DAAJ01-75-C-0770)
(AD-A021139; USAAVSCOM-TR-75-49) Avail: NTIS CSCL 01/3

This development program was funded to develop and test a backup cover for the Window Cutting Assemblies of the AH-1 Canopy Removal System. The purpose of the backup cover is to extend the service life of a Window Cutting Assembly which has developed a crack in the polycarbonate retainer. The function of the backup cover (or shell) is to aid the damaged retainer in directing explosive energy and fragments from a Window Cutting Assembly outboard away from the crewmen. This report defines the design of the backup cover, the testing performed to substantiate the design and documents the successful completion of this testing. The testing included twenty-one (21) subscale tests to verify the environmental capability of the shell design and two (2) full-scale canopy removal tests of the right side of the airframe from a simulated crash attitude. GRA

N76-27848 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE OPERATION OF HELICOPTERS FROM SMALL SHIPS
J. W. Davies *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p (For availability see N76-27846 18-52)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N76-27226*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SIMPLE TOTAL ENERGY SENSOR
Oran W. Nicks Mar. 1976 35 p refs
(NASA-TM-X-73928) Avail: NTIS HC $4.00 CSCL 01D

This research concerns a simple technique for total energy compensation having the primary requirement of good compensation with a low cost, easy to make sensor. A comprehensive library search and a small wind tunnel were used to explore fundamentals and to develop a number of probes which were flight tested with satisfactory results. Simple probe configurations were tested using the characteristics of laminar flow separation around a small cylinder to produce a sensor pressure having the desired relationship between static and dynamic pressures. Wind tunnel and flight tests confirmed the concepts for a wide range of speeds, altitudes, and flow directions encountered in soaring. Data and findings are presented, along with a discussion of factors important to total energy compensation. Author

N76-27227# Dikewood Corp., Albuquerque, N.Mex.
SPECIFICATIONS FOR DRONE/RPV INSTRUMENTATION AT THE HILL/WENDOVER/DUGWAY RANGES Final Report
J. L. Nolan Feb. 1976 35 p refs
(Contract F29601-74-C-0022)
(AD-A020821; AFSWC-TR-75-12) Avail: NTIS CSCL 01/3

This report evaluates the compatibility of a proposed HAMOTS (High Accuracy Multiple Object Tracking System) for a multiple drone/RPV test range in the Hill/Wendover/Dugway area with the proposed mid-term Continental Operations Range (COR). The following documentation was reviewed: (1) Position Location/Display System Specification, (2) System Software Specifications, (3) Timing Network Specifications, (4) Pointing Data Network Specifications, (5) Facilities Requirements, and (6) Activation Plan. Under the premise that this system is implemented prior to initiation of Mid-Term COR development in the Hill/Wendover/Dugway area, there is nothing that has been found in these specifications that would represent a major stumbling block to utilization of the system as part of Mid-Term COR in that area. The HAMOTS with its computer displays and software, along with the telemetry system and the pointing data system should be viewed as a single instrumentation system for purposes of Mid-Term COR planning. Author (GRA)

N76-27228# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYSIS OF THE USE OF ELAPSED TIME INDICA-

TORS IN F/FB-111 AVIONICS SUBSYSTEMS M.S. Thesis
James A. Richmond Dec. 1975 161 p refs
(AD-A020370; GSM/SM/75D-20) Avail: NTIS CSCL 01/3

The use of Elapsed Time Indicators (ETI's) on Air Force aircraft subsystems is an outgrowth of the Air Force's growing concern for equipment reliability, which was spawned shortly after World War II. It was not until after the agree Report was published in 1957, however, that the use of ETI's gained momentum in the Air Force. Now ETI's are used on subsystems in every model of aircraft in the air inventory electronic subsystems are particularly adaptable to the use of ETI's. Avionics subsystems make up the bulk of electronic subsystems on most aircraft, and it is here that most of the ETI's can usually be found on Air Force aircraft. By measuring the operating time on an electronic subsystem, elapsed time indicators provide time data, which combined with failure data, can be used in reliability and maintainability studies, in warranty enforcement, in actuarial analyses, and in maintenance planning, as well as some other applications. But while ETI's have a number of uses in theory, there is some question about how much use they actually receive in operational applications. The objective of this investigation, therefore, addresses the issue of whether the use of ETI's is beneficial to the Air Force. GRA

N76-27229# Hughes Research Labs., Malibu, Calif.
HOLOGRAPHIC LENS FOR PILOT'S HEAD-UP DISPLAY, PHASE 3 Final Report, 18 Mar. - 17 Sep. 1975
A. Au, A. Graube, and L. G. Cook Warminster, Pa. NADC 1 Feb. 1976 116 p refs
(Contract N62269-75-C-0299)
(AD-A020945; NADC-75293-30) Avail: NTIS CSCL 09/5

The report describes work on the fabrication of the full-scale holographic lens for a wide field of view (FOV) head-up display (HUD) system. The basic system parameters are a 25 degrees FOV, a 25 in. eye relief, and a 3 in. high by 5 in. wide exit pupil. Processing equipments and techniques were fabricated and developed for recording the 16 in. diameter holographic element on 18 in. x 18 in. dye-sensitized dichromated gelatin. Works include a design study of reflection hologram collimator/combiner and the fabrication and test of a T90-N8-21.9 transmission hologram lens. GRA

N76-27230# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEMONSTRATION OF A LINEAR MODEL FOR CHOOSING THE PAVE LOW 3 HELICOPTER AVIONICS COMPUTER M.S. Thesis
Don H. Owen Nov. 1975 100 p refs
(AD-A020367; GSM/SM/75D-19) Avail: NTIS CSCL 09/2

A linear model for decision making can be used by program managers when the decision variables are independent and conditionally monotone in their relationship to each other. The choice of an airborne avionics computer for the Pave Low 3 HH-53 helicopter provided a situation which met these two conditions. The four independent, monotone decision variables included performance characteristics, delivery schedule, maintenance considerations, and life cycle costs. By using a group of judges to determine the importance of each variable in relation to the others and by assigning a quantitative value to each variable, the linear model was able to provide a method for choosing between two computer candidates for the HH-53.GRA

N76-27231# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SOFTWARE SUPPORT FOR THE F-16 AVIONIC COMPUTERS M.S. Thesis
Bruce A. Vendt Dec. 1975 152 p refs
(AD-A020361; GSM/SM/75D-23) Avail: NTIS CSCL 09/2

An effort to bring the software maintenance of the F-16 avionic computers in-house after several years of contracted effort is described. A cost analysis shows that the more emphasis placed on in-house support, the lower the cost program. It is recommended that the F-16 software support program be manned with as many inservice personnel as manpower resources allow. However, manpower budget constraints within the Air Force indicate that the majority of the support personnel will probably be contract employees. GRA

N76-27855 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Flight Skills Research Section.
ADVANCES IN MILITARY COCKPIT DISPLAYS
J. M. Rolfe *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p refs (For availability see N76-27846 18-52)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N76-27232* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INSTRUMENTATION FOR MEASURING AIRCRAFT NOISE AND SONIC BOOM Patent
Allan J. Zuckerwar, inventor (to NASA) (Old Dominion Univ.) Issued 22 Jun. 1976 8 p Filed 1 Jul. 1975 Supersedes N75-27334 (13 - 18, p 2249) Sponsored by NASA
(NASA-Case-LAR-11476-1; US-Patent-3,964,319; US-Patent-Appl-SN-592159; US-Patent-Class-73-557) Avail: US Patent Office CSCL 14B

Improved instrumentation suitable for measuring aircraft noise and sonic booms is described. An electric current proportional to the sound pressure level at a condenser microphone is produced and transmitted over a cable and amplified by a zero drive amplifier. The converter consists of a local oscillator, a dual-gate field-effect transistor mixer, and a voltage regulator/impedance translator. The improvements include automatic tuning compensation against changes in static microphone capacitance and means for providing a remote electrical calibration capability.
Official Gazette of the U.S. Patent Office

N76-27233*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
BLADE END WALL FLOWS IN COMPRESSORS Semiannual Progress Report
N. Sitaram and B. Lakshminarayana 30 Jun. 1976 35 p refs
(Grant NsG-3032)
(NASA-CR-148310) Avail: NTIS HC $4.00 CSCL 20D

A brief summary of previous work carried out on end wall flow phenomena is presented with major emphasis on annulus wall boundary layer. Author

N76-27234*# Georgia Inst. of Tech., Atlanta.
PROPAGATION OF AIRCRAFT NOISE Final Technical Report
A. D. Pierce and W. J. Hadden, Jr. Jul. 1976 27 p refs
(Grant NsG-1047)
(NASA-CR-148321; FTR-2) Avail: NTIS HC $4.00 CSCL 20A

The major tasks undertaken were (1) analytical and laboratory experiments on the propagation of sound from sources near a flat surface of finite acoustic impedance; (2) laboratory experiments dealing with the reflection of sound from finite sized plane patches; and (3) the diffraction of sound by wedge-and trapezoidal-shape barriers. In addition, a series of measurements were made of the background noise levels for various jet flow conditions in the Anechoic Noise Facility of the Langley Research Center's Acoustic and Noise Reduction Laboratory. Author

N76-27235*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
THE-CFM-56: BALANCE SHEET OF 18 MONTHS OF TESTING
J. Morisset Washington NASA Jul. 1976 9 p Transl. into ENGLISH from Air et Cosmos (France), vol. 13, 13 Dec. 1975 p 23-25
(Contract NASw-2789)
(NASA-TT-F-17072) Avail: NTIS HC $3.50 CSCL 21E

The CFM-56 bypass turbojet engine is described. The design

offers advantages of high bypass ratio and an advanced core engine comprising a single-stage blower and compressor. Performance data on the core-engine components, with over 6000 test hours, are given. Foreign body ingestion tests, aerodynamic noise tests, and crosswind and tailwind performance tests are discussed. Author

N76-27236*# Kanner (Leo) Associates, Redwood City, Calif.
THE CFM56 TURBOJET ENGINE: PROGRESS IN THE REDUCTION OF ENGINE NOISE
J. P. Bernard and P. Raffy Washington NASA Jun. 1976 40 p refs Transl. into ENGLISH from proceedings of the twelfth Association Aeronautique et Astronautique de France, Congress International Aeronautique, (Paris), 29-30 May 1975 33 p
(Contract NASw-2790)
(NASA-TT-F-17109) Avail: NTIS HC $4.00 CSCL 21E

The CFM56 is a double-body, dual-flow (functioning in separated flow and multiphase flow) engine with 10 tons of thrust. Test facilities for examining the aerodynamic, internal and engine noise characteristics of the turbojet are described. A facility for determining the effectiveness of acoustic attenuation treatment on the engine is included. Most of the research was carried out under the Quiet Engine Program. Maximal engine noise is plotted as a function of thrust, and noise spectra at landing approach, takeoff and intermediate flight speeds are presented. Author

N76-27237*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A METHOD TO ACCOUNT FOR VARIATION OF AVERAGE COMPRESSOR INLET PRESSURE DURING INSTANTANEOUS DISTORTION ANALYSES
Paul L. Burstadt and Leon M. Wenzel 1976 11 p refs Presented at the 12th Propulsion Conf., Palo Alto, Calif., 26-29 Jul. 1976; sponsored by AIAA and SAE
(NASA-TM-X-73438; E-8793) Avail: NTIS HC $3.50 CSCL 21E

A method is presented to calculate the available surge margin as a function of time and incorporate it into an instantaneous distortion analysis. Results show that inlet pressure variations which cause only a small change at the compressor exit can cause a significant variation in the available surge margin. Author

N76-27238*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYPERSONIC RESEARCH ENGINE/AEROTHERMODYNAMIC INTEGRATION MODEL, EXPERIMENTAL RESULTS. VOLUME 2: MACH 6 PERFORMANCE
Earl H. Andrews, Jr. and Ernest A. Mackley Apr. 1976 426 p refs Prepared in cooperation with AiRes. Mfg. Co. 4 Vol.
(Contract NAS1-6666)
(NASA-TM-X-72822) Avail: NTIS HC $11.75 CSCL 21E

Computer program performance results of a Mach 6 hypersonic research engine during supersonic-and subsonic combustion modes were presented. The combustion mode transition was successfully performed, exit surveys made, and effects of altitude, angle of attack, and inlet spike position were determined during these tests. Author

N76-27239# Polish Academy of Sciences, Warsaw.
MODEL DESIGN AND DYNAMIC ANALYSIS OF ROTORS [MODELOWANIE I ANALIZA DYNAMICZNA WIRNIKOW]
Agnieszka Muszynska 11 Sep. 1975 263 p refs In POLISH Avail: NTIS HC $9.00

In the very general mathematical model presented, geometric and kinematic as well as physical peculiarities of rotors are expressed. The model is presented in matrix form. Methods of realizing the synthesis of a rotor and its optimization considering selected criteria and limited data are also described. The presented mathematical model of a rotor is very universal and represents the common denominator for the majority of models described and analyzed in the literature. The motion of symmetric models with nonlinear characteristics and the conditions for displacing the situation of relative balance are also analyzed. Author

N76-27240*# General Electric Co., Cincinnati, Ohio. Dept. of Advanced Engineering and Technology Programs.
QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE) AERODYNAMIC CHARACTERISTICS OF 30.5 CENTIMETER DIAMETER INLETS
D. L. Paul Aug. 1975 102 p refs
(Contract NAS3-18021)
(NASA-CR-134866; R75AEG494) Avail: NTIS HC $5.50 CSCL 21E

A low speed test program was conducted in a 9- by 15-foot V/STOL wind tunnel to investigate internal performance characteristics and determine key design features required for an inlet to meet the demanding operational conditions of the QCSEE application. Four models each having a design average throat Mach number of 0.79 were tested over a range of incidence angle, throat Mach number, and freestream velocity. Principal design variable was internal lip diameter ratio. Stable, efficient inlet performance was found to be feasible at and beyond the 50 deg incidence angle required by the QCSEE application at its 41.2 m/sec (80 knot) nominal takeoff velocity, through suitably designed inlet lip and diffuser components. Forebody design was found to significantly impact flow stability via nose curvature. Measured inlet wall pressures were used to select a location for the inlet throat Mach number control's static pressure port that properly balanced the conflicting demands of relative insensitivity to flow incidence and sufficiently high response to changes in engine flow demand. Author

N76-27241# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
PROCEEDINGS OF A WORKSHOP ON COMBUSTION MEASUREMENTS IN JET PROPULSION SYSTEMS
R. Gouland, ed (George Washington Univ., Washington, D. C.) Dec. 1975 499 p refs Workshop held at Purdue Univ., 22-23 May 1975 Sponsored in part by Navy, AFOSR, and NSF
(AD-A020386; SQUID-PU-R1-76) Avail: NTIS CSCL 20/4

Contents: needed measurements in combustor technology--(new directions in combustion research, combustion models, combustor design and phenomenology); optical measurement techniques--(laser velocimetry, absorption-emission and resonance techniques, scattering measurements, interferometry); probe methods and special techniques--(probe measurements in laminar flows, probe measurements in turbulent flows, particulate measurements in combustion), forum--(velocity, concentrations, temperature, droplets and particulates, turbulence). GRA

N76-27242# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
INTEGRATED ACCESSORY SYSTEMS FOR SMALL GAS TURBINE ENGINES Final Report, 1 May 1973 - 30 Jun. 1975
Bob C. Miller Jan. 1976 282 p refs
(Contract DAAJ02-73-C-0003; DA Proj. 1F2-62209-AH-76)
(AD-A021177; PWA-FR-6983; USAAMRDL-TR-75-46) Avail: NTIS CSCL 21/5

The intent of the Integrated Accessory Systems for the Small Gas Turbine Engines Program was to optimize the controls and accessory systems for the next generation of small turboshaft gas turbine engines for Army helicopter applications. A 1977 development time frame was considered. A primary objective of the program was to reduce vulnerability of the controls and accessory components without severely compromising other important design criteria. During the Phase I conceptual design phase, analyses and preliminary designs of Control and Accessory (C and A) configurations for both front- and rear-drive engines were accomplished. Phase II included preliminary design of two candidate control and accessory systems and selection of one system for detailed design. A tower shaft control and accessory drive with an air turbine starter was selected, and a detailed system design of all C and A components was accomplished. The critical items of the C and A system were identified and test programs were recommended for Phase III. Phase III included testing of the following critical items: (1) fuel pump inducer (inlet suction tests), (2) high-speed oil pump (cavitation tests), (3) electronics cooling techniques (performance tests), (4) power turbine overspeed sensor (performance tests), and (5) starter overrunning clutch (endurance tests). Author (GRA)

N76-27243# Naval Intelligence Support Center, Washington, D.C. Translation Div.
MAIN DESIGN CHARACTERISTICS OF GAS TURBINE ENGINE GTU-20
I. A. Pasenko 15 Jan. 1976 15 p Transl. into ENGLISH from Energomashinostroyeniye (USSR), no. 5, 1962 p 8-12
(AD-A021086; NISC-Trans-3743) Avail: NTIS CSCL 21/5

A new kind of power engine, the gas turbine engine, is now in the inital stage of its development. The design of the GTU-20 gas turbine engine permits the unit method of assembly and disassembly to be used. The engine proper consists of the following components which are delivered assembled for installation: (1) two turbocompressors with drive box, starter, mounted on one frame with an automatic control system; oil, water, fuel, and electrical systems; the so-called turbocompressor unit (tcu); (2) air cooler assembled; (3) regenerator assembled (for regenerator model); (4) air passages and gas passage with compensators. The turbocompressor unit, air cooler, and regenerator are able, by virtue of their size and weight, to be transported and installed assembled. It must be noted that the GTU-20 gas turbine engine, by virtue of its characteristics, can be successfully used both to drive a ship propeller as well as for other installations, including fixed power engineering works. At present, each GTU-20 engine before delivery passes through long plant tests under complete load for the purpose of a comprehensive and careful design checkout as well as a check of the engine's reliability for many hours of operation under load. GRA

N76-27244# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
OPTIMIZATION OF GOVERNOR DESIGN IN HELICOPTER PROPULSION SYSTEMS WITH ZERO TORSIONAL STIFFNESS COUPLINGS Final Report, Jan. 1974 - Dec. 1975
John M. Vance, Michael G. Veno, and Joseph J. Curran (GE) 30 Sep. 1975 75 p
(Grant DAHC04-74-G-0089)
(AD-A020495; ARO-12095.1-RTL) Avail: NTIS CSCL 01/3

The effect of a torsional isolater on governor design for helicopter turboshaft engines was investigated mathematically. It was found that the torsional isolater can significantly improve torsional stability if the power turbine governor is redesigned to take advantage of the isolater characteristics. GRA

N76-27245# Naval Weapons Engineering Support Activity, Washington, D.C.
ENGINE LIFE MANAGEMENT SIMULATION MODEL (ELMSIM) USER'S MODEL
William E. Clark, Jr. and William C. Booth Sep. 1975 91 p ref
(AD-A020307; NAVWESA-R-7510) Avail: NTIS CSCL 01/3

ELMSIM was developed in 1974-1975 as an interim measure to assist in the evaluation of the number and distribution of spare aircraft engines of the U.S. Navy pending the development of a four maintenance echelon analytical technique, NAVMET (to be published as Report R-7511), and also for use in evaluating changes in assumptions and results of NAVMET. The model simulates the removal of engines from aircraft at an operating base and their subsequent flow through the base or depot repair or overhaul process and transit pipelines. The report describes the model, and includes a program listing and a description of variables. It discusses assumptions, calculations, output reports and analytical applications. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N76-27246# National Aeronautical Establishment, Ottawa (Ontario).
A FLIGHT INVESTIGATION USING VARIABLE GLIDE PATH TRAJECTORIES TO COMPENSATE FOR WINDS AND MODERATE WIND SHEARS
W. S. Hindson and R. E. Smith Feb. 1976 62 p refs
(LR-589; NRC-15215) Avail: NTIS HC $4.50

The influence of wind, wind shears, and turbulence on the approach and landing tasks of STOL and V/STOL aircraft has become of significant concern for this evolving class of flight vehicles, particularly during instrument flight operations. Flight experiments were carried out to assess the considerations in alleviating the effects of along-track, a priori wind, including moderate shears, by adjusting the approach glide path for the conditions of the day. A Bell 205A helicopter modified as an airborne simulator and equipped with a modest programmable guidance and display capability was used for the tests, which were carried out in the operational environment of the Rockcliffe (Ottawa) STOLport. Author

N76-27247*# Decision Science, Inc., San Diego, Calif.
DESIGN OF AN ALL-ATTITUDE FLIGHT CONTROL SYSTEM TO EXECUTE COMMANDED BANK ANGLES AND ANGLES OF ATTACK Technical Report, Jan. 1975 - Jan. 1976
George H. Burgin and David M. Eggleston Jan. 1976 162 p refs
(Contract NAS1-13773)
(NASA-CR-145004) Avail: NTIS HC $6.75 CSCL 01C

A flight control system for use in air-to-air combat simulation was designed. The input to the flight control system are commanded bank angle and angle of attack, the output are commands to the control surface actuators such that the commanded values will be achieved in near minimum time and sideslip is controlled to remain small. For the longitudinal direction, a conventional linear control system with gains scheduled as a function of dynamic pressure is employed. For the lateral direction, a novel control system, consisting of a linear portion for small bank angle errors and a bang-bang control system for large errors and error rates is employed. Author

N76-27248*# Kanner (Leo) Associates, Redwood City, Calif.
EXPLICIT FORM OF THE OPTIMUM CONTROL LAW FOR A RIGID AIRCRAFT FLYING-IN TURBULENT ATMOSPHERE
G. Coupry Washington NASA Jul. 1976 22 p refs Transl. into ENGLISH from "Forme explicite de la loi optimale de pilotage d'un avion rigide volant en atmosphere turbulente," NATO, AGARD Symp. on Impact of Active Control Tech. on Airplane Design, Paris, ONERA TP no. 1412, 13-18 Oct. 1974 p 9-1 to 9-10
(Contract NASw-2790)
(NASA-TT-F-17094; ONERA-TP-1412) Avail: NTIS HC $3.50 CSCL 01C

Flight of military aircraft at high speeds and low altitudes makes it necessary to use ride control systems to improve comfort, handling qualities and combat ability. In designing such systems, flexibility can be omitted, due to the large difference between the frequencies associated with flight mechanics and those associated with the first flexible mode. Closed loop systems which feed back some output information to the controls through appropriate filters are widely used by designers, but increase the response time of the aircraft during maneuvering, which can be a source of difficulty in some missions. The open loop system described senses turbulence, which is used, after filtering, to activate the controls. This type of system has no effect on the handling qualities of the aircraft. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N76-27249*# Grumman Aerospace Corp., Bethpage, N.Y.
BALLASTIC SIGNATURE IDENTIFICATION SYSTEMS STUDY Final Report
Abraham Reich and Thomas L. Hine 14 May 1976 48 p

(Contract NAS9-14707)
(NASA-CR-147798) Avail: NTIS HC $4.00 CSCL 14B

The results are described of an attempt to establish a uniform procedure for documenting (recording) expended bullet signatures as effortlessly as possible and to build a comprehensive library of these signatures in a form that will permit the automated comparison of a new suspect bullet with the prestored library. The ultimate objective is to achieve a standardized format that will permit nationwide interaction between police departments, crime laboratories, and other interested law enforcement agencies. Author

N76-27250# Weapons Research Establishment, Salisbury (Australia).
THE COMPLETE SOFTWARE FOR THE S1 WIND TUNNEL DATA ACQUISITION AND CONTROL SYSTEM
I. C. Heron Sep. 1975 195 p refs
(WRE-Rept-1484(WR/D)) Avail: NTIS HC $7.50

The S1 wind tunnel data acquisition system is based on a PDP-15/PDP-11 dual processor (UNICHANNEL-15) computer. It incorporates a large amount of instrumentation which has been designed locally. This report describes in detail the data acquisition and control software which services the system and includes full operating instructions for intending users. Computer listings of all programs are also presented. Author

N76-27251# Royal Aircraft Establishment, Farnborough (England).
SIMULATION OF SEVERE COLLISIONS WITH AN ELECTRO-HYDRAULIC CATAPULT SYSTEM
W. Lange Feb. 1976 18 p refs Transl. into ENGLISH from Automobiltech. Z. (Stuttgart), v 72, no. 5, 1970 p 162-167
(RAE-Lib-Trans-1886; BR52718) Avail: NTIS HC $3.50

A hydraulic catapult system is described which enables a test sledge to be subjected to controlled impacts. The reactions of the test subject on the sledge are investigated by force and acceleration measurements, and filmed by a high frequency camera mounted on the sledge. A series of experiments to investigate the subject of whiplash trauma in crashes was carried out using dead human bodies. Information was gained on the effect of prior damage to the cervical vertebrae, unconnected with the accident, on the severity of the trauma produced, as well as on the importance of head support. Author

N76-27252*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CRYOGENIC WIND TUNNELS: UNIQUE CAPABILITIES FOR THE AERODYNAMICIST
Robert M. Hall Jul. 1976 16 p refs Presented at the 54th Annual Meeting of the Va. Acad. of Sci.
(NASA-TM-X-73920) Avail: NTIS HC $3.50 CSCL 14B

The cryogenic wind-tunnel concept as a practical means for improving ground simulation of transonic flight conditions. The Langley 1/3-meter transonic cryogenic tunnel is operational, and the design of a cryogenic National Transonic Facility is undertaken. A review of some of the unique capabilities of cryogenic wind tunnels is presented. In particular, the advantages of having independent control of tunnel Mach number, total pressure, and total temperature are highlighted. This separate control over the three tunnel parameters will open new frontiers in Mach number, Reynolds number, aeroelastic, and model-tunnel interaction studies. Author

N76-27253# California Univ., Livermore. Lawrence Livermore Lab.
LLL TRANSIENT-ELECTROMAGNETICS-MEASUREMENT FACILITY
F. J. Deadrick, E. K. Miller, and H. G. Hudson 29 Oct. 1975 32 p refs
(Contract W-7405-eng-48)
(UCRL-51933) Avail: NTIS HC $4.00

The operation and hardware of the Lawrence Livermore Laboratory's transient-electromagnetics (EM)-measurement facility are described. The transient-EM range is useful for determining the time-domain transient responses of structures to incident EM pulses. To illustrate the accuracy and utility of the EM-measurement facility, actual experimental measurements are compared to numerically computed values. Author (ERA)

N76-27254# Sandia Labs., Albuquerque, N.Mex.
ELECTROMAGNETIC ENVIRONMENTS SIMULATOR (EMES)
G. B. Varnado Nov. 1975 112 p refs
(Contract AT(29-1)-789)
(SAND-75-0412) Avail: NTIS HC $5.45

A multipurpose electromagnetic environments simulator was designed to provide a capability for performing EMR, EMP, and lightning near stroke testing of systems, subsystems and components in a single facility. The final facility design and the analytical experimental verification of the design are presented. Author (NSA)

N76-27255# Rome Univ. (Italy).
HYPERTHERMAL AERODYNAMIC WIND TUNNEL: GENERAL PROBLEMS AND CONSTRUCTIVE SOLUTIONS [PROBLEMI GENERALI E SOLUZIONI CONSTRUTTIVE NEL PROGETTO DI UNA GALLERIA AERODINAMICA IPERTERMICA]
Ugo Ponzi, Giuseppe Giampalmo, and Guido Morelli Sep. 1974 83 p refs In ITALIAN; ENGLISH summary
(Rept-42) Avail: NTIS HC $5.00

The possibilities of simulation of hypersonic flight conditions are related to the characteristics of different wind tunnels, in particular to arc-heated hyperthermal facilities. Some technological, constructive and operative problems encountered during the design of a 1 MW hyperthermal facility are examined together with their solutions. The estimated envelopes of test section conditions of the hyperthermal facility are finally shown. Author (ESA)

N76-27256# National Aerospace Lab., Amsterdam (Netherlands). Div. Fluid Dynamics.
THE PROPOSED LARGE EUROPEAN HIGH-REYNOLDS NUMBER TRANSONIC WIND TUNNEL (LEHRT)
J. P. Hartzuiker 30 May 1975 14 p refs Presented at the AGARD Flight Mech. Panel Symp. on Flight/Ground Testing Facilities Correlation, Valloire, France, 9-12 Jun. 1975
(NLR-MP-75018-U) Avail: NTIS HC $3.50

The background and present day activities in connection with the proposed European high Reynolds number transonic facility, LEHRT, which could be operational around 1982 are sketched from the technical point of view. Three concepts for the drive system of that facility, including the Ludwieg tube concept, Evans clean tunnel concept, and Injector facility concept, were still under consideration; a recommendation on the preferred drive system was expected by the end of 1975. It is envisaged that the governments of France, the Federal Republic of Germany, the Netherlands, and the United Kingdom will start the project definition phase of LEHRT within 1976. ESA

N76-27257# National Aerospace Lab., Amsterdam (Netherlands). Div. Fluid Dynamics.
DESIGN AND CALIBRATION OF THE 1/10th SCALE MODEL OF THE NLR LOW SPEED WIND TUNNEL LST 8x6
J. C. A. VanDitshuizen 29 Aug. 1975 17 p refs Presented at the AGARD Symp. on Wind Tunnel Design and Testing Tech., London, 6-8 Oct. 1975
(NLR-MP-75031-U) Avail: NTIS HC $3.50

A model was built at scale 1:10 of the LST 8x6 wind tunnel to investigate the aerodynamic design features and provide additional information concerning unconventional items such as a throttle for augmentation of the circuit loss factor and a system for intermittent ventilation. The design philosophy is outlined, followed by a survey of the results of the calibration. When possible, theoretical predictions and experimentally obtained data have been compared. The results indicate that the requirements set for the full scale tunnel will be met. Author (ESA)

N76-27258# Logistics Management Inst., Washington, D.C.
CASE STUDIES OF THE AIR FORCE AEROSPACE GROUND EQUIPMENT (AGE) ACQUISITION MANAGEMENT PROCESS
Theodore R. ODonnell and John D. Forster Dec. 1975 202 p
(Contract ARPA SD-321)
(AD-A020180; LMI-74-22) Avail: NTIS CSCL 01/5

This study was undertaken to determine the effectiveness of Air Force Policies and procedures for acquiring support

equipment, and to develop recommendations for change. The study approach included two principal tasks: (1) the preparation of procedural flowcharts depicting the support equipment acquisition process; and (2) the analysis of a cross-section of support equipment acquisitions against the background of current policies and procedures. Eight defense systems were selected for study: F-15, A-10, RPV, AIMS, 485L, AF SATCOM, DSP and MMIII. From among those systems, the acquisition of 76 items of support equipment was reviewed in detail. The principal objective of those reviews was to determine (1) the extent to which policy has been implemented; and (2) the degree to which policy and implementing procedures are achieving their intended purpose. This study indicates that acquisition policies are sound and comprehensive, and that acquisition procedures are reasonably effective for all types of support equipment except complex electronic test equipment. The Air Force support equipment acquisition process has improved in recent years. Six systems were using similar procedures instead of each having a unique procedure as found in previous studies. The use of similar procedures has improved communications among supporting offices. Some important improvements were noted in drawer/component standardization and in new standardization data bases. GRA

N76-27259# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EXPERIMENTAL VERIFICATION OF A THEORETICAL LOADING FUNCTION DESCRIBING MOMENTUM TRANSFER FROM AN EXPLOSION TO A TREE STEM Final Report
Malcolm P. Keown, Jack K. Stoll, and Hansjoerg Nikodem Jan. 1976 122 p
(DA Proj. 4A0-62112-A-859)
(AD-A021188; WES-TR-M-76-2) Avail: NTIS CSCL 01/5

This study was conducted to validate methods previously developed by the Waterways Experiment Station to theoretically predict the clearing capability of a given explosive at a selected site in a forested area to be used as a helicopter landing zone. The prediction depends largely on a theoretical loading function used in the solution of a partial differential equation that describes the motion of a tree stem being acted upon by a shock front. Special equipment was designed to evaluate the loading function in terms of the impulse experienced by free-flying logs, which represented the tree stems. Seven explosions of 0.09-metric-ton TNT equivalent yield were detonated to provide adequate data for evaluation. Each explosion was monitored for the correct yield and shock-front symmetry. The results show good agreement between the stem loading predicted by the theoretical loading function and the actual loading experienced by the logs during the tests. GRA

N76-27260# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
PLAN FOR CONVERSION OF DTNSRDC 7- X 10-FOOT TRANSONIC WIND TUNNEL TO PROVIDE V/STOL CAPABILITY Final Report
Sep. 1975 22 p Presented at the Meeting of the Supersonic Tunnel Assoc. (STA) (41st), Los Angeles, Calif., 28-29 Mar. 1974
(AD-A019267; Aero-1210; DTNSRDC-4691) Avail: NTIS CSCL 14/2

A plan is presented for adding a 12- x 15-foot V/STOL test section in the return leg of the 7- x 10-foot transonic wind tunnel at the David W. Taylor Naval Ship Research and Development Center (DTNSRDC). Features include (1) an inflatable bellmouth which is collapsible/removable to permit conversion from V/STOL to transonic operation on a quick turnaround basis and (2) provision for opening roof doors in the V/STOL section to permit low-speed operation in an alternate section 22 feet high by 15 feet wide. Author (GRA)

N76-27261# Naval Air Engineering Center, Lakehurst, N.J. Engineering Dept.
PROCEDURE FOR CERTIFICATION TESTS OF TYPE C MARK 13 MOD 1 CATAPULTS, FLUSH DECK NOSE GEAR LAUNCH EQUIPMENT, BRIDLE ARRESTERS, AND JET BLAST DEFLECTORS ON USS NIMITZ CLASS VESSELS
William W. Riedel 30 Dec. 1975 184 p refs
(AD-A020093; NAEC-ENG-7430-Rev-B) Avail: NTIS CSCL 13/10

This report contains the procedure for shipboard tests of Type C13 Mod 1 catapults and all associated launcher equipment on NIMITZ CLASS VESSELS. Included are safety precautions, visual checks, static proof loads, hydrostatic tests, signal system tests, functional tests, wet accumulator charging and blowdown tests, establishment of water level, instrumentation requirements and deadload calibration. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N76-27262*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Mar. - Apr. 1976
15 Jun. 1976 218 p refs
(Contract NAS7-100)
(NASA-CR-148297; JPL-PR-42-33) Avail: NTIS HC $7.75 CSCL 22D

Deep space network supporting research and technology activities centered on spacecraft communications and ground support systems in multiple mission flight projects are presented. For individual titles, see N76-27263 through N76-27284.

N76-27263* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Office of Tracking and Data Acquisition.
NETWORK FUNCTIONS AND FACILITIES c14
N. A. Renzetti *In its* The Deep Space Network 15 Jun. 1976 p 1-3 (For availability see N76-27262 18-12)
CSCL 14B

The objectives, functions, and organization of the Deep Space Network are summarized; deep space station, ground communication, and network operations control capabilities are described. Author

N76-27264* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM DATA RECORDS c17
E. C. Gatz *In its* The Deep Space Network 15 Jun. 1976 p 4-7 refs (For availability see N76-27262 18-12)
CSCL 17B

The DSN telemetry system now includes the capability to provide a complete magnetic tape record, within 24 hours of reception, of all telemetry data received from a spacecraft. This record, the intermediate data record, is processed and generated almost entirely automatically, and provides a detailed accounting of any missing data. Author

N76-27265* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VIKING MISSION SUPPORT c14
D. J. Mudgway and D. W. Johnston *In its* The Deep Space Network 15 Jun. 1976 p 8-20 refs (For availability see N76-27262 18-12)
CSCL 22D

On April 26, 1976, the network operations control center was declared available for planetary operations in support of the Viking project. This final capability in the network configuration for Viking had been delayed since February with hardware and software problems both in the control center and at the Deep Space stations. The effect of these problems, particularly insofar as they affected production of intermediate data records, the resolution of the problems, and the current status of the network operations control center in the Viking environment, are given in this article. Also discussed are the operational verification tests performed to check out the new capabilities and associated procedures. The Viking project tests supported by the DSN and finally the DSN support of Viking cruise operations, along with some statistics on performance, are included. Author

N76-27266* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
PIONEER 10 AND 11 MISSION SUPPORT c14
R. B. Miller *In its* The Deep Space Network 15 Jun. 1976

p 21-25 (For availability see N76-27262 18-12)
CSCL 22D

Possible improvements in the Deep Space Network and their potential effect on the telecommunications limit of Pioneer 10 and on Pioneer 11 Saturn encounter are discussed. Author

N76-27267* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HELIOS MISSION SUPPORT **c14**
P. S. Goodwin, W. G. Meeks, and R. E. Morris *In its* The Deep Space Network 15 Jun. 1976 p 27-31 refs (For availability see N76-27262 18-12)
CSCL 22D

With Helios-1 completing its third perihelion and Helios-2 passing its first perihelion, much valuable scientific data were obtained about the inter-earth-sun regions. The first solar occultation of Helios-2 is anxiously awaited as the next important mission phase. Preparations are underway for Helios-2 first entry into solar occultation in mid-May 1976. This article reports on the activities around Helios-1 and -2 perihelions. Author

N76-27268* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
A DISTRIBUTED DATA BASE MANAGEMENT CAPABILITY FOR THE DEEP SPACE NETWORK **c60**
A. I. Bryan *In its* The Deep Space Network 15 Jun. 1976 p 32-36 ref (For availability see N76-27262 18-12)
CSCL 09B

The Configuration Control and Audit Assembly (CCA) is reported that has been designed to provide a distributed data base management capability for the DSN. The CCA utilizes capabilities provided by the DSN standard minicomputer and the DSN standard nonreal time high level management oriented programming language, MBASIC. The characteristics of the CCA for the first phase of implementation are described. Author

N76-27269* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
ALSEP: QUASAR DIFFERENTIAL VLBI **c90**
M. A. Slade, R. A. Preston, A. W. Harris, L. J. Skjerve, and D. J. Spitzmesser *In its* The Deep Space Network 15 Jun. 1976 p 37-54 refs (For availability see N76-27262 18-12)
CSCL 03C

A program of Apollo Lunar Surface Experiments Package (ALSEP)-Quasar Very Long Baseline Interferometry (VLBI) is being reported. These observations primarily employ a 4 antenna technique, whereby simultaneous observations with two antennas at each end of an intercontinental baseline are used to derive the differential interferometric phase between a compact extragalactic radio source (usually a quasar) and a number of ALSEP transmitters on the lunar surface. A continous ALSEP-quasar differential phase history over a few hour period leads to extremely high angular accuracy in measuring the lunar position against the quasar reference frame. This application of the 4 antenna technique has been underway for more than a year and is now producing high quality data utilizing Deep Space Network (DSN) stations in Australia, Spain, and Goldstone, California, as well as the Spaceflight Tracking and Data Network (STDN) Apollo station at Goldstone. Author

N76-27270* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Engineering Section.
CONCEPTUAL STUDIES FOR NEW LOW-COST 64-m ANTENNAS **c33**
R. Levy *In its* The Deep Space Network 15 Jun. 1976 p 55-67 refs (For availability see N76-27262 18-12)
CSCL 09C

Recent software developments expedite design investigations of proposed new 64-m antenna structures. The software consists of programs to generate structure model data and a design program that chooses preferential cross sectional sizes of the structural members. Numerous new designs are summarized that can represent weight savings of from 25% to 50% with respect to the tipping weight of the existing Mars antenna. These designs provide a more favorable symmetrical support for the reflector backup and tend to provide superior surface accuracy for gravity, although not necessarily wind, loading on the antenna. Author

N76-27271* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Elements Research Section.
DSS 14 OPERATING NOISE TEMPERATURE DURING HELIOS 1 NEAR-SUN TRACKING **c92**
C. T. Stelzried and D. Girdner *In its* The Deep Space Network 15 Jun. 1976 p 68-76 refs (For availability see N76-27262 18-12)
CSCL 03B

When spacecraft are tracked near the line-of-sight of the sun, the ground antenna sidelobes see the solar noise. The solar noise increases the ground system operating noise temperature and degrades the downlink RF reception performance. At specific antenna azimuthal angles relative to the sun, noise peaks and nulls occur periodically throughout a day's tracking pass due to the quadripod support leg-generated sidelobes. This article documents this effect while tracking Helios 1, illustrates the time of the peaks, and compares the predicted time of the noise temperature peaks with the measured data. Author

N76-27272* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Elements Research Section.
DEVELOPMENT OF A WATER VAPOR RADIOMETER TO CORRECT FOR TROPOSPHERIC RANGE DELAY IN DSN APPLICATIONS **c35**
P. D. Batelaan, T. Sato, S. D. Slobin, and H. Reilly *In its* The Deep Space Network 15 Jun. 1976 p 77-84 refs (For availability see N76-27262 18-12)
CSCL 14B

The rationale for a Water Vapor Radiometer (WVR) as an aid in predicting tropospheric delay correction is presented. Included is a block diagram and a description of the present developmental WVR with the semiautomated operating sequence outlined. A brief summary of field tests at El Monte airport and Pt. Mugu is given. Author

N76-27273* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Data Systems Development Section.
SIMPLE INTUITIVE MODELS OF PROGRAMMING **c61**
R. C. Tausworthe *In its* The Deep Space Network 15 Jun. 1976 p 85-95 refs (For availability see N76-27262 18-12)
CSCL 09B

It is hypothesized that mathematical models of the programming process can be formulated to gauge the sensitivities of that process to various given parameters, and that such models can be calibrated on an empirical basis and used as guides toward maximizing productivity, documentation quality, and programming reliability. Three oversimplified models are presented as illustrations. Author

N76-27274* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Data Systems Development Section.
SOFTWARE PRODUCTION METHODOLOGY TESTED PROJECT **c61**
R. C. Tausworthe *In its* The Deep Space Network 15 Jun. 1976 p 96-106 refs (For availability see N76-27262 18-12)
CSCL 09B

The history and results of a 3 1/2-year study in software development methodology are reported. The findings of this study have become the basis for DSN software development guidelines and standard practices. The article discusses accomplishments, discoveries, problems, recommendations and future directions. Author

N76-27275* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Systems Research Section.
STANDARD INTERFACE: TWIN-COAXIAL CONVERTER **c60**
W. A. Lushbaugh *In its* The Deep Space Network 15 Jun. 1976 p 107-111 refs (For availability see N76-27262 18-12)
CSCL 09B

The network operations control center standard interface has been adopted as a standard computer interface for all future minicomputer based subsystem development for the Deep Space Network. Discussed is an intercomputer communications link using a pair of coaxial cables. This unit is capable of transmitting and receiving digital information at distances up to 600 m with complete ground isolation between the communicating devices.

A converter is described that allows a computer equipped with the standard interface to use the twin coaxial link. Author

N76-27276* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM PERFORMANCE WITH CONVOLUTIONALLY CODED DATA: MAXIMUM LIKELIHOOD DECODING Final Report **c17**
B. Benjauthrit *In its* The Deep Space Network 15 Jun. 1976 p 112-122 refs (For availability see N76-27262 18-12)
CSCL 17B

DSN telemetry system performance is analyzed based on convolutionally coded data for the short constraint length 7:1/2 codes at low bit rates, 8 to 2,048 bits per second, obtained from CTA 21 for the S-band configuration. The results indicate that a loss of one or more decibels in the system performance may be expected due to system degradation. Also, burst error lengths up to 100 bits may not be unusual in actual operational situations. Author

N76-27277* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM PERFORMANCE WITH CONVOLUTIONALLY CODED DATA: SEQUENTIAL DECODING UPDATE **c17**
C. A. Greenhall *In its* The Deep Space Network 15 Jun. 1976 p 123-130 ref (For availability see N76-27262 18-12)
CSCL 17B

DSN telemetry system performance in decoding convolutionally coded data by both sequential and maximum likelihood techniques is being determined by testing at various deep space stations. This article describes corrections and refinements to the sequential decoding tests. Author

N76-27278* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN PERFORMANCE TESTS OF A MAXIMUM LIKELIHOOD DECODER **c61**
J. M. Urech, L. D. Vit, and C. A. Greenhall *In its* The Deep Space Network 15 Jun. 1976 p 131-146 refs (For availability see N76-27262 18-12)
CSCL 09B

Viterbi decoding tests were carried out at DSS 62, Madrid, Spain. Results of bit error rate, burst statistics, and estimation of signal-to-noise ratio are presented. Author

N76-27279* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Quality Assurance DSN and Mechanical Hardware Section.
MODIFICATION OF MOORE MEASURING MACHINE/LEITZ MICROSCOPE **c38**
H. A. Greth and L. Brubaker *In its* The Deep Space Network 15 Jun. 1976 p 147-154 refs (For availability see N76-27262 18-12)
CSCL 14D

Quality assurance mechanical inspection, anticipating the need for improved measuring techniques for the various laboratory programs, has perfected a modification of the Leitz microscope for the Moore measuring machine that has the capability of significantly reducing inspection time with increased reliability. Author

N76-27280* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
PIONEER VENUS ENTRY SIMULATOR **c14**
C. E. Johns *In its* The Deep Space Network 15 Jun. 1976 p 155-158 ref (For availability see N76-27262 18-12)
CSCL 22D

To assure successful tracking of the four Pioneer Venus probes, it is necessary for the deep space station receiver operators to be familiar with the characteristics of the received signals. As an aid for training the operators for this mission, signal simulators have been developed which completely duplicate the probe signals. This article describes the method used for generating these test signals. Author

N76-27281* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Network Operations Section.
DOPPLER NOISE CONSIDERED AS A FUNCTION OF THE SIGNAL PATH INTEGRATION OF ELECTRON DENSITY **c92**
A. L. Berman and J. A. Wackley *In its* The Deep Space Network 15 Jun. 1976 p 159-193 refs (For availability see N76-27262 18-12)
CSCL 03B

The hypothesis is advanced that observed Doppler noise during solar conjunctions is proportional to total columnar electron content along the signal path. This assumption leads directly to a geometrical model (ISED) for observed Doppler noise which is shown to be in very good agreement with Doppler noise data accumulated during the 1975 Pioneer 10, Pioneer 11 and Helios 1 solar conjunctions. An augmented model is constructed which quantitatively indicates correlation between earth observed sunspot activity and systematic, cyclical deviations from the ISED model. Author

N76-27282* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Network Operations Section.
A NEW ALGORITHM FOR PREDICTING THE APPARENT POLARIZATION ANGLE OF LINEARLY POLARIZED SPACECRAFT **c13**
R. S. Schlaifer *In its* The Deep Space Network 15 Jun. 1976 p 194-198 ref (For availability see N76-27262 18-12)
CSCL 22A

With the advent of nonecliptic spacecraft orbits and the inclusion of a NASA X-Y mounted antenna within the DSN it has become apparent that the current polarization angle prediction formulas may be insufficient for future needs. This article presents a new formulation for predicting the polarization angle which properly accommodates these new features in a concise, straightforward form. Author

N76-27283* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
DSN DIPLEXER, NOISE BURST TESTING **c17**
R. B. Kolbly *In its* The Deep Space Network 15 Jun. 1976 p 199-205 (For availability see N76-27262 18-12)
CSCL 17B

The testing of a new design high power S-band diplexer is reported. The megawatt Cassegrain diplexer (MCD) is to be used for DSN operations. The tests described were performed at 100 kW at the Venus Deep Space Station (DSS 13) transmitter test area. At 100 kW or less no degradation of receive performance was detected. Author

N76-27284* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
DSN RESEARCH AND TECHNOLOGY SUPPORT **c14**
E. B. Jackson *In its* The Deep Space Network 15 Jun. 1976 p 206-211 ref (For availability see N76-27262 18-12)
CSCL 14B

Continuing testing and refinement of the remote controlled, unattended automated pulsar observing station is noted, along with routine pulsar observations of 22 pulsars. Radar observations of geostationary satellite are discussed. Current status of the 400-kW X-band radar is reported along with routine automatic testing of the stability-reliability of the DSS 13 maser-receiver noise adding radiometer combination. A failure in the Faraday rotation receiving system is noted along with discussion in some detail of the activities of the high power transmitter maintenance facility. Continuation of receiver phase stability testing, specifically the effects of temperature on coaxial cables, is discussed and results reported. A demonstration at full power of the microwave power transmission facility is noted and routine support of the planetary radio astronomy experiment is discussed. Transmission of master clock synchronization signals to overseas DSN stations is also reported. Author

N76-27285*# Lockheed Missiles and Space Co., Huntsville, Ala. Huntsville Research and Engineering Center.
THERMAL AND CONVECTION ANALYSES OF THE DENDRITE REMELTING ROCKET EXPERIMENT; EXPERIMENT 74-21 IN THE SPACE PROCESSING ROCKET PROGRAM Final Report
P. G. Grodzka, J. E. Pond, J. W. Spradley, and May Helen Johnson 31 May 1976 50 p refs
(Contract NAS8-31800)
(NASA-CR-149920; LMSC-HREC-TR-D496847) Avail: NTIS

HC $4.00 CSCL 11F

The Dendrite Remelting Rocket Experiment was performed aboard a Black Brant VC Sounding Rocket during a period which gravity levels of approximately 0.00001 g prevailed. The experiment consisted of cooling an aqueous ammonium chloride solution in a manner such that crystallization of ammonium chloride crystals proceeded throughout a three minute period of zero-g. The crystallization process during flight was recorded on 35 mm panatomic-x film. A number of ground crystallizations were similarly recorded for comparison purposes. The convective and thermal conditions in aqueous and metallic liquid systems were assessed under conditions of the flight experiment to help establish the relevance of the rocket experiment to metals casting phenomena. The results indicate that aqueous or metallic convective velocities in the Dendrite Remelting Rocket Experiment cell are of insignificant magnitudes at the 0.0001 to 0.00001 g levels of the experiment. The crystallization phenomena observed in the Rocket Experiment, therefore, may be indicative of how metals will solidify in low-g. Author

N76-27286*# Joint Publications Research Service, Arlington, Va.

FIFTEEN YEARS IN SPACE

V. Shatalov Washington NASA Jun. 1976 9 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 4, Apr. 1976 p 4-6

(NASA Order W-13183)

(NASA-TT-F-15486) Avail: NTIS HC $3.50 CSCL 22A

Stages in designing Soviet manned and unmanned spacecraft are traced historically. Emphasis is placed on the Salyut 4 space station. The joint U.S.-U.S.S.R. Apollo-Soyuz mission is detailed as an example of a trend of joint space flights between the two countries, for which compatible equipment for approach and docking had to be designed and flight-tested. Author

N76-27287*# Joint Publications Research Service, Arlington, Va.

OUTLINES OF THE FUTURE IN SPACE

V. P. Denisov, V. I. Alimov, A. A. Zhurenko, and V. A. Misharin Washington NASA Jul. 1976 42 p refs Transl. into ENGLISH from "Kontury Budushchego" Moscow, Mashinostroyeniye Press, 1975 p 313-348

(NASA Order W-13183)

(NASA-TT-F-17081) Avail: NTIS HC $4.00 CSCL 22A

Developments in the exploration of regions near the earth, moon, and the rest of the solar system, as well as practical applications of world space programs for the remainder of the twentieth century are discussed. A table of predicted dates of possible developments is given. Author

N76-27288# Princeton Center for Alternative Futures, N. J.

THE RESOURCES OF SPACE

Hugh Downs Jul. 1976 10 p

Avail: NTIS HC $3.50

A plea is made for the continued support of NASA space programs. Technological benefits in the areas of medicine, agriculture, environment protection and monitoring are cited. Emphasis is placed on the development and use of solar energy through a satellite solar power system. J.M.S.

N76-27289*# Ohio State Univ. Research Foundation, Columbus.

THE IDENTIFICATION OF SCIENTIFIC PROGRAMS TO UTILIZE THE SPACE ENVIRONMENT Final Report, Jun. 1975 - Jun. 1976

F. A. Kulacki and R. M. Nerem Jun. 1976 206 p refs

(Grant NsG-1212)

(NASA-CR-148455; TR-4207-1) Avail: NTIS HC $7.75 CSCL 22A

A program to identify and develop ideas for scientific experimentation on the long duration exposure facility (LDEF) was completed. Four research proposals were developed: (1) Ultra pure germanium gamma ray radiation detectors in the space environment, intended to develop and demonstrate an X-ray and gamma-ray spectroscopy system incorporating a temperature cyclable high-purity germanium detector and diode heat pipe cryogenic system for cooling, (2) growth, morphogenesis and metabolism of plant embryos in the zero-gravity environment, to investigate if the space environment induces mutations in the embryogenic cells so that mutants of commercial significance with desirable attributes may be obtained, (3) effect of zero gravity on the growth and pathogenicity of selected zoopathic fungi. It is possible that new kinds of treatment for candidiasis, and tichophytosis could eventuate from the results of the proposed studies, and (4) importance of gravity to survival strategies of small animals. Gravitational effects may be direct or mediate the selection of genetic variants that are preadapted to weightlessness. Author

N76-27290# European Space Agency, Paris (France).

REPORT PRESENTED TO THE NINETEENTH COSPAR MEETING

K.-P. Wenzel, comp. et al 15 Mar. 1976 261 p refs Conf. held at Philadelphia, Jun. 1976

Avail: NTIS HC $9.00

Scientific results from satellites already launched are presented (ESRO-2, ESRO-1, HEOS-1, HEOS-2, TD-1, ESRO-4, COS-B), and a survey of satellites under development (GEOS, IUE, Meteosat, ISEE, Exosat), are given. Work in Europe on Spacelab is reported. Author (ESA)

N76-27291# European Space Agency, Paris (France).

LOW-COST SPACELAB OPERATIONS: A EUROPEAN VIEWPOINT

D. J. Shapland and J. deWaard 1976 16 p Presented at the 13th Space Congr., Cocoa Beach, Fla., 7-9 Apr. 1976

Avail: NTIS HC $3.50

The use of the Shuttle-Spacelab orbital laboratory must entail low costs for the experimenter. This can only be assured if low-cost procedures are adopted throughout the experiment cycle, including development, integration and flight. Some ideas on how the inherent low-cost features of the Shuttle and Spacelab designs can best be exploited are expressed. Some considerations for European involvement in Spacelab operations are presented and it is suggested that manned space experimentation could benefit considerably from fresh approaches originating in Europe. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N76-27292*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.

PROPOSED POWERED EXPLICIT GUIDANCE THRUST INTEGRALS DERIVATION/IMPLEMENTATION. MISSION PLANNING, MISSION ANALYSIS AND SOFTWARE FORMULATION

R. F. Jaggers 7 May 1976 55 p

(Contract NAS9-14960)

(NASA-CR-147796; Design-Note-1.4-7-38) Avail: NTIS HC $4.50 CSCL 22A

A new exoatmospheric, powered explicit guidance (PEG) thrust integral formulation and a simple method of implementation are presented. The new thrust integral formulation is significantly simpler than that currently used in PEG. Preliminary estimates indicate a computer storage savings of 220 words, which is approximately 10 percent of the current PEG ascent program. Alternate methods of implementation that could produce even more savings are noted. Author

N76-27293*# Joint Publications Research Service, Arlington, Va.

RETURN FROM ORBIT (SPACEFLIGHT PROBLEMS)

N. Ivanov Washington NASA Jun. 1976 9 p Transl. into ENGLISH from Aviat. Kosmonavt (USSR), no. 5, May 1976 p 42-43

(NASA-TT-F-17079) Avail: NTIS HC $3.50 CSCL 22C

Matching descent orbits to the desired landing site rests on a large number of flight factors. Interplay of these factors is described and several graphs show how the time of day and date of the month bear on the launch window and landing orbits that must be brought into harmony for the return of a spacecraft from orbit. Author

N76-27294*# McDonnell-Douglas Astronautics Co., Houston, Tex.
ANALYSIS OF ECLSS PERFORMANCE DURING REENTRY AFTER LOSS OF ONE AMMONIA TANK Space Shuttle Engineering and Operations Support
G. J. Steines 19 Feb. 1976 33 p refs
(Contract NAS9-13970)
(NASA-CR-147805; Rept-1.4-7-29) Avail: NTIS HC $4.00 CSCL 22A

An analysis was performed to determine whether, in case of a loss of one of the ammonia tanks, the Ammonia Boiler System can provide adequate heat rejection for the orbiter ECLSS during reentry. Results indicate that temperatures can be maintained as long as NH3 is available, but that one tank does not contain sufficient NH3 to complete all missions. A recommendation is made to investigate incorporation of onboard NH3 quantity calculations, and/or addition of a third NH3 tank.
Author

N76-27295*# McDonnell-Douglas Astronautics Co., Houston, Tex. Astronautics Div.
ORBITER/CARRIER SEPARATION FOR THE ALT FREE FLIGHT NO. 1 REFERENCE TRAJECTORIES. MISSION PLANNING, MISSION ANALYSIS AND SOFTWARE FORMULATION Space Shuttle Engineering and Operations Support
G. M. Glenn 1 Mar. 1976 49 p refs
(Contract NAS9-13970)
(NASA-CR-147806; Rept-1.4-7-30) Avail: NTIS HC $4.00 CSCL 22A

Details of the generation of the separation trajectories are discussed. The analysis culminated in definition of separation trajectories between physical separation and orbiter/carrier vortex clearance. Specifications, assumptions and analytical approach used to generate the separation trajectories are presented. Results of the analytical approach are evaluated. Conclusions and recommendations are summarized. Supporting references are listed.
Author

N76-27296*# McDonnell-Douglas Astronautics Co., Houston, Tex.
ORBITER ALTITUDE AT ALT INTERFACE BASED ON ALSES (APPROACH AND LANDING SHUTTLE ENGINEERING SIMULATION) ANALYSES. MISSION PLANNING, MISSION ANALYSIS AND SOFTWARE FORMULATION
C. L. Colwell 16 Feb. 1976 21 p refs
(Contract NAS9-13970)
(NASA-CR-147804) Avail: NTIS HC $3.50 CSCL 22A

The details of the orbiter altitude attainable at the approach and landing tests (ALT) interface determined by the approach and landing shuttle engineering simulation (manned) were documented. The analysis culminated in t' verification of the trends observed in a similar analysis penormed previously on the space vehicle dynamics simulation (unmanned). Altitude variations attributable to pilot steering variability ranged between 492 ft higher to 383 ft lower. The requirement for this parametric analysis is first elaborated. The specifications, assumptions, and analytical approach used to determine the orbiter altitude at the ALT interface are then presented, followed by the results of the analytical approach and the conclusions and recommendations.
Author

N76-27297*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
RENDEZVOUS REQUIREMENTS AND CANDIDATE WORST CASE FLIGHTS FROM THE OCTOBER 1973 SPACE SHUTTLE TRAFFIC MODEL Space Shuttle Engineering and Operations Support
T. J. Kreiter 9 Dec. 1974 24 p refs
(Contract NAS9-13970)
(NASA-CR-147815; Rept-1.4-3-8) Avail: NTIS HC $3.50 CSCL 22A

Data appearing in the October 1973 space shuttle traffic model were analyzed to determine the rendezvous requirements for the proposed shuttle flights occurring between 1980 and 1991. Four families of flights have been identified, namely, single-payload rendezvous, multiple-payload rendezvous, payload and tug rendezvous, and tug only rendezvous. Charts have been prepared which summarize the respective data. Observations are presented for each of the four flight families, and worst case flights are proposed from each family for further analysis. Author

N76-27298*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
ANALYTIC DRAG CONTROLLER GUIDANCE GAINS EVALUATION. MISSION PLANNING, MISSION ANALYSIS AND SOFTWARE FORMULATION Space Shuttle Engineering and Operations Support
J. H. Treybig 28 Feb. 1975 26 p
(Contract NAS9-13970)
(NASA-CR-147813; Rept-1.4-4-6) Avail: NTIS HC $4.00 CSCL 22A

Results of a study to optimize the guidance gains for the analytical drag control entry guidance system are presented. The guidance gains were optimized for study points chosen in all phases of entry.
Author

N76-27299*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
ORBITAL LIFETIME CAPABILITIES OF DIGITAL PROGRAMS RMDAP AND MONSTER Space Shuttle Engineering and Operations Support
24 Jan. 1975 12 p refs
(Contract NAS9-13970)
(NASA-CR-147814; Rept-1.4-3-11) Avail: NTIS HC $3.50 CSCL 22A

The orbital lifetime study capabilities of the Reference Mission Design and Analysis Program (RMDAP) and the Apollo Mission Planning and Real-Time Rendezvous Support Program (ARRS or Monster) were studied. Output and program versatility, that is, the methods with which each program permits user definition of the major factors affecting orbital lifetimes, are discussed. In addition, orbit maintenance is examined and sample runs are compared. Since each program has special capabilities in different areas, it is left to the investigator's discretion as to the preferable program to employ for his lifetime study purposes.
Author

N76-27300*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
NOMINAL PROFILE REFINEMENTS REPORT: TARGET IN 120 NAUTICAL MILE CIRCULAR ORBIT Space Shuttle Engineering and Operations Support
24 Dec. 1974 18 p refs
(Contract NAS9-13970)
(NASA-CR-147816; Rept-1.4-3-10) Avail: NTIS HC $3.50 CSCL 22A

The compability of the nominal rendezvous sequence with low target orbits is addressed. It was found that for targets in low earth orbits certain modifications of the nominal sequence are required to achieve a feasible anytime liftoff capability, notably the use of elliptical phasing orbits and the allowance of up to two days for rendezvous under certain phasing conditions.
Author

N76-27301*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
MISSION PAYLOADS SUBSYSTEM DESCRIPTION, REVISION 2
J. M. Williams Jun. 1976 186 p refs
(Contract NAS9-12200)
(NASA-CR-147801; LEC-7390; JSC-10787) Avail: NTIS HC $7.50 CSCL 22A

The Mission Payloads Subsystem (MPLS) which utilizes a simplified trajectory model to generate a list of missions for the Scheduling Algorithm for Mission Planning and Logistics Evaluation (SAMPLE) program is described. The MPLS is the mechanism that forms the basis of input for the other subsystems of SAMPLE and various post processors.
Author

N76-27302*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
REFERENCE MISSION 3B ASCENT TRAJECTORY. MISSION PLANNING, MISSION ANALYSIS AND SOFTWARE FORMULATION
A. E. Kuhn 11 Feb. 1975 49 p refs
(Contract NAS9-13970)

(NASA-CR-147809) Avail: NTIS HC $4.00 CSCL 22A

Mission 3B is designed as a payload retrieval mission with both shuttle launch and orbiter landing to take place at the western test range. The mission is designed for direct rendezvous with a passive satellite in a 100 NMI circular orbit with an inclination of 104 degrees. The ascent portion of mission 3B is described as well as the trajectory simulation. Author

N76-27303*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Houston Astronautics Div.

NOMINAL PROFILE REFINEMENTS REPORT: TARGETS IN 150 AND 190 NAUTICAL MILE CIRCULAR ORBITS

T. J. Kreiter 28 Feb. 1975 31 p refs

(Contract NAS9-13970)

(NASA-CR-147810; Design-Note-1.4-3-13) Avail: NTIS HC $4.00 CSCL 22A

Refinements for 150 and 190 n.mi. circular target orbits were examined along with the potential advantages of ground-hold as a means of reducing the phasing times associated with low orbit rendezvous. Author

N76-27304*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MULTI-SATELLITE ATTITUDE PREDICTION PROGRAM/ ORBITING SOLAR OBSERVATORY-8 (MSAP/OSO-8) OPERATING GUIDE

V. H. Tate (Computer Sciences Corp., Los Angeles), D. C. Wyckoff (Computer Sciences Corp., Los Angeles), and J. M. DeCicco Mar. 1976 154 p refs

(Contract NAS5-11999)

(NASA-TM-X-71158; X-582-76-153) Avail: NTIS HC $6.75 CSCL 22A

The sun's lower corona and chromosphere and their interaction in the X-ray and ultraviolet (UV) spectral regions were investigated to better understand the transport of energy from the photosphere to the corona. The interaction between the solar electromagnetic and particle radiation and the earth's environment was studied and the background component of cosmic X-rays was discussed. Author

N76-27282* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Network Operations Section.

A NEW ALGORITHM FOR PREDICTING THE APPARENT POLARIZATION ANGLE OF LINEARLY POLARIZED SPACECRAFT

R. S. Schlaifer *In its* The Deep Space Network 15 Jun. 1976 p 194-198 ref (For availability see N76-27262 18-12)

CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N76-27305*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

EXPERIMENT DEFINITION PHASE SHUTTLE LABORATORY. LDRL-10.6 EXPERIMENT Quarterly Report, 27 Sep. 1975 - 26 Jan. 1976

Feb. 1976 34 p

(Contract NAS5-2001)

(NASA-CR-144775; SCG-60097R-Rept-D-824; QR-6; MR-12) Avail: NTIS HC $4.00 CSCL 14B

The work completed on the experiment definition phase of the shuttle laboratory LDRL 10.6 micrometers experiment from 27 September 1975 to 26 January 1976 was reported. This work included progress in the following areas: (1) optomechanical system: completion of detail drawings, completion of the beryllium subassembly, fabrication, checking, and weighing of approximately 95% of the detailed parts, dry film lubrication of the bearings and gears, and initiation of assembly of the gimbals; (2) optics: update of the detailed optical layout, receipt of nine mirrors and the pre-expander; (3) miscellaneous: delivery of draft material for the final report, completion of optical testing of the 10.6 micrometers receiver, and receipt, assembly, and checkout of NASA test console. Author

N76-27306*# Joint Publications Research Service, Arlington, Va.

THE COSMODROME

N. Prigozhin and A. Khaldeyev Washington NASA [1975] 6 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 4, Apr. 1976 p 38-39

(NASA Order W-13183)

(NASA-TT-F-17082) Avail: NTIS HC $3.50 CSCL 14B

A cosmodrome is defined, its functions are listed, and a brief review is given of the major ones throughout the world, with emphasis on Baikonur. Author

N76-27307*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

DATA REDUCTION COMPLEX ANALOG-TO-DIGITAL DATA PROCESSING REQUIREMENTS FOR ONSITE TEST FACILITIES

J. D. Debbrecht May 1976 22 p

(Contract NAS9-12200)

(NASA-CR-147817; LEC-8768; JSC-11322) Avail: NTIS HC $3.50 CSCL 14B

The analog to digital processing requirements of onsite test facilities are described. The source and medium of all input data to the Data Reduction Complex (DRC) and the destination and medium of all output products of the analog-to-digital processing are identified. Additionally, preliminary input and output data formats are presented along with the planned use of the output products. Author

N76-27308*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

DESIGN DOCUMENT FOR NAVIGATION AID CONSOLE (SDD 36115461)

G. D. Doland Jun. 1976 36 p

(Contract NAS9-12200)

(NASA-CR-147800; LEC-8380; JSC-11140) Avail: NTIS HC $4.00 CSCL 14B

A design study for the navigation aid console to be used for flight simulation operation is presented. Author

N76-27309*# General Electric Co., Philadelphia, Pa.

FINAL DEFINITION AND PRELIMINARY DESIGN STUDY FOR THE INITIAL ATMOSPHERIC CLOUD PHYSICS LABORATORY, A SPACELAB MISSION PAYLOAD

1 Jul. 1976 295 p

(Contract NAS8-31845)

(NASA-CR-149931) Avail: NTIS HC $9.25 CSCL 14B

The Atmospheric Cloud Physics Laboratory (ACPL) task flow is shown. Current progress is identified. The requirements generated in task 1 have been used to formulate an initial ACPL baseline design concept. ACPL design/functional features are illustrated. A timetable is presented of the routines for ACPL integration with the spacelab system. A.S.K.

N76-27310# European Space Agency, Paris (France).

SIMULATION OF SPACELAB EXPERIMENT OPERATIONS USING A CV 990 AIRCRAFT

D. J. Shapland and J. deWaard [1975] 20 p

Avail: NTIS HC $3.50

Experimentation from Spacelab will represent a completely new approach to space observations. Similarities between the experiment operations foreseen for Spacelab and those practiced in the course of airborne observations from a NASA-operated CV 990, have led to a proposed joint ESA and NASA simulation mission. This mission (ASSESS) executed during the period June 2-17, 1975, permits the performance of valuable science in the form of a multidiscipline payload consisting of 6 experiments (3 from Europe, 3 from U.S.) and, at the same time, allows simulation of certain Spacelab conditions. The results of the latter provide valuable information affecting experiment design, experiment operations, mission management and Spacelab subsystem design. Author (ESA)

N76-27263* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Office of Tracking and Data Acquisition.
NETWORK FUNCTIONS AND FACILITIES
N. A. Renzetti *In its* The Deep Space Network 15 Jun. 1976 p 1-3 (For availability see N76-27262 18-12)
CSCL 14B

N76-27265* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VIKING MISSION SUPPORT
D. J. Mudgway and D. W. Johnston *In its* The Deep Space Network 15 Jun. 1976 p 8-20 refs (For availability see N76-27262 18-12)
CSCL 22D

N76-27266* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
PIONEER 10 AND 11 MISSION SUPPORT
R. B. Miller *In its* The Deep Space Network 15 Jun. 1976 p 21-25 (For availability see N76-27262 18-12)
CSCL 22D

N76-27267* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HELIOS MISSION SUPPORT
P. S. Goodwin, W. G. Meeks, and R. E. Morris *In its* The Deep Space Network 15 Jun. 1976 p 27-31 refs (For availability see N76-27262 18-12)
CSCL 22D

N76-27280* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
PIONEER VENUS ENTRY SIMULATOR
C. E. Johns *In its* The Deep Space Network 15 Jun. 1976 p 155-158 ref (For availability see N76-27262 18-12)
CSCL 22D

N76-27284* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
DSN RESEARCH AND TECHNOLOGY SUPPORT
E. B. Jackson *In its* The Deep Space Network 15 Jun. 1976 p 206-211 ref (For availability see N76-27262 18-12)
CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N76-27311*# Joint Publications Research Service, Arlington, Va.
INTERKOSMOS-15 IN FLIGHT
N. Zheleznov Washington NASA Jul. 1976 5 p Transl. into ENGLISH from Sots. Industriya (USSR), 22 Jun. 1976 p 3
(NASA Order W-13183)
(NASA-TT-F-17116) Avail: NTIS HC $3.50 CSCL 22A

The fifteenth satellite of the Interkosmos series was launched on 19 June 1976. Objective of the launching was the in-flight testing of new satellite systems, including a telemetric system designed for transmitting observational data to ground stations in the U.S.S.R. and socialist countries. The telemetric system was developed through the joint efforts of scientists in the U.S.S.R., Hungary, East Germany, Poland, and Czechoslovakia. Author

N76-27312# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
PRELIMINARY ACCOMMODATION STUDY FOR A MATERIAL SCIENCE PAYLOAD ESA Spacelab Utilization Program. Executive Summary
20 Mar. 1976 82 p refs Prepared jointly with Battelle Inst.
(Contract ESA-SC/98-HQ)
(ESA-CR(P)-801) Avail: NTIS HC $5.00

A study was made of the typical materials science reference experiment proposals for Spacelab in order to verify and refine a conceptual hardware inventory. The impact of centralized functions such as control/monitoring on the hardware inventory is identified by performing trade-offs. A commonality analysis is made for definition of common facilities and peculiar equipment to meet technical requirements of single experiments. An analysis is given of development planning aspects. A first order cost estimate is presented and operational schedules for the total material science payload inventory are prepared. ESA

N76-27313# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
FLOATING ZONE ELECTROPHORESIS FACILITY FOR SPACELAB, PHASE A STUDY Final Report
R. A. Henderson and A. Vickery Mar. 1976 154 p refs
(Contract ESA-SC/96-HQ)
(ESS/SS-696; ESA-CR(P)-807) Avail: NTIS HC $6.75

The feasibility of developing a general purpose floating zone electrophoresis facility for Spacelab was studied. Topics dealt with include the preliminary theoretical analysis of the floating zone phenomenon, the proposed sounding rocket experiment series, a first Spacelab mission electrophoresis facility, and a projection of the general purpose facility. The baseline interface characteristics of the early mission facility and of the postulated multi-user facility are: volume 0.18 resp. 2.5 cu m; mass 35 and 350 kg; power 0.1 and 3.0 kW; peak power 0.13 and 4.1 kW; control data 30.0 and 100 bps; and monitoring data: 250 bps for multi-user facility. The budgetary price indication (January 1976 rates) is 1,225,000 AU for the period mid-1976 to end 1980. Author (ESA)

N76-27314# European Space Research and Technology Center, Noordwijk (Netherlands). Communication Systems Div.
COMMUNICATION SATELLITES PROGRAMME. THE ORBITAL TEST SATELLITE
A. J. Bayliss 10 Mar. 1975 10 p Presented at the Ned. Elektron-en Radiogenootschap, Utrecht, 21 May 1974
Avail: NTIS HC $3.50

A general description is given of ESA's Orbital Test Satellite, considering its communication functions for telephony and television and its related experimental program. ESA

N76-27315# European Space Research and Technology Center, Noordwijk (Netherlands).
SPACELAB: OVERVIEW AND IMPLEMENTATION STATUS
Heinz Stoewer 1975 9 p refs Presented at the 11th Intern. Symp. on Space Technol. and Sci., Tokyo, 30 Jun. - 5 Jul. 1975
Avail: NTIS HC $3.50

The history of the Spacelab program evolution is briefly reviewed. Limitations and constraints as well as the subsystem resources available to potential users are stressed. A broad outline of the current status, Spacelab key design features, and subsystems and major Spacelab elements are described. Management interrelationships with NASA and the respective roles of ESA and NASA are summarized. A description of ESA's utilization planning for Spacelab is presented. ESA

N76-27316# European Space Research and Technology Center, Noordwijk (Netherlands).
SPACELAB AND ITS CAPABILITIES
J. J. Burger 1975 10 p Presented at the CNES/ESRO Symp. on Technol. of Space Expts., Paris, 26-30 May 1975
Avail: NTIS HC $3.50

Details of the Spacelab concept are described as well as its technical capabilities. These include, apart from the normal laboratory-like structural and electrical support, an environmental control system permitting manned operations of the experiment in a shirt-sleeve atmosphere and a sophisticated command and data management system. Access to the space environment is provided on pallets and by airlocks. Some examples are given of Spacelab's utilization for space research. ESA

N76-27317# European Space Agency, Paris (France).
SPACELAB PROGRAMME: STATUS REVIEW
Bernard Deloffre 1975 34 p refs Presented at the 21st Ann. Meeting of the Am. Astronautical Soc. on Space Shuttle Missions of the 80's, Denver, 26-28 Aug. 1975
(AAS-Paper-75-124) Avail: NTIS HC $4.00

A management survey of the Spacelab program is presented,

and recent progress is reported. The role of Spacelab in the context of the overall space transportation system is explained and the chosen concept and its mission flexibility are described. Funding, management, and scheduling aspects are discussed. Some comments are given on European-related aspects of Spacelab operations. ESA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N76-27318*# Joint Publications Research Service, Arlington, Va.

SPACE TRANSPORT SYSTEMS

V. I. Levantovskiy Washington NASA Jun. 1975 49 p refs Transl. into ENGLISH from Novoye v Zhizni, Nauke, Tekhn., Seriya Kosmonavtika, Astronomiya (USSR), no. 3, 1976 p 1-64

(NASA Order W-13183)

(NASA-TT-F-15484) Avail: NTIS HC $4.00 CSCL 22B

Timely problems of modern space technology -- conversion from one-time use carrier rockets to multiple use space transport vehicles -- are outlined. These systems permit regular maintenance of long-term orbital stations and automatic earth satellites, circumlunar orbital stations and lunar bases, and also facilitate organization of flights in the solar system and interplanetary expeditions. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N76-27319*# National Scientific Labs., Inc., McLean, Va.

FORTY AND 80 GHz TECHNOLOGY ASSESSMENT AND FORECAST INCLUDING EXECUTIVE SUMMARY

D. G. Mazur, R. J. Mackey, Jr., S. G. Tanner, F. J. Altman, J. J. Nicholas, Jr., and K. A. Duchaine May 1976 404 p refs

(Contract NAS3-19724)

(NASA-CR-135028; Rept-21-030) Avail: NTIS HC $11.00 CSCL 17B

The results of a survey to determine current demand and to forecast growth in demand for use of the 40 and 80 GHz bands during the 1980-2000 time period are given. The current state-of-the-art is presented, as well as the technology requirements of current and projected services. Potential developments were identified, and a forecast is made. The impacts of atmospheric attenuation in the 40 and 80 GHz bands were estimated for both with and without diversity. Three services for the 1980-2000 time period -- interactive television, high quality three stereo pair audio, and 30 MB data -- are given with system requirements and up and down-link calculations. Author

N76-27320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DISASTER WARNING SATELLITE STUDY UPDATE

E. H. Davison, ed., E. F. Miller, G. Anzic, R. C. Braley, and Culp May 1976 37 p refs Revised

(NASA-TM-X-73407; E-8732) Avail: NTIS HC $4.00 CSCL 17B

Project planning and research and development by NASA's Lewis Research Center, on a NOAA satellite network system for surveillance of natural daresters is reported. Topics discussed are: (1) number and type of warning channels for the satellite system, (2) number of antenna beams in the satellite system, (3) number of satellites needed for adequate coverage by the satellite system, (4) power requirements for the satellite system, (5) downlink and uplink frequencies, power requirements for the satellite system, and (6) costs and service life of the satellite system. J.R.T.

N76-27321# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

TRACKING DURING STATION KEEPING OF OTS: EFFICIENCY OF WEILHEIM INTERFEROMETER DATA AND MADRID RANGE DATA IN ADDITION TO ANGULAR AND RANGE DATA OF FUCINO

A. Leibold 11 Nov. 1975 15 p refs

(DLR-IB-552-75/15) Avail: NTIS HC $3.50

The efficiency of tracking station data for the Orbital Test Satellite during the stationkeeping phase is considered for tracking network planning purposes. Results of an orbit determination accuracy study by Telesat for the Fucino and Madrid tracking stations are compared with the results of a study by DFVLR for Fucino, Weilheim, and Madrid. Results were obtained by an analysis program. Two other approaches are also given using simulated interferometer tracking data and Symphonie satellite results. The conclusions are that as an additional station to Fucino the Weilheim interferometer can compete with a range station to be built near Madrid, and Weilheim can provide full back-up tracking service, whereas this is not possible with a single range station. ESA

N76-27322# Centre National d'Etudes Spatiales, Toulouse (France).

IDENTIFICATION OF THE TRAJECTORY OF A PROPULSED SPACE VEHICLE [IDENTIFICATION DE LA TRAJECTOIRE D'UN VEHICULE SPATIAL PROPULSE]

Jean-Francois Dulck Jan. 1976 162 p refs In FRENCH; ENGLISH summary

(CNES-NT-29) Avail: NTIS HC $6.75

Numerical filtering techniques for the identification of space vehicle trajectories are discussed, notably polynomial filter, Wiener filter and classical Kalman filter techniques. The relationship between these methods and the difficulties associated with each method are described and compared. The Kalman technique is shown to be the best adapted method to solve the divergence problem frequently encountered in the restitution of the unforeseeable trajectory. By introducing a few noise spectral characteristic considerations in the design of the Kalman filter a theoretical solution to the divergence problem is proposed. The results of a computer simulation for post flight data analysis and for real time data analysis are presented. Author (ESA)

N76-27323# Centre National d'Etudes Spatiales, Toulouse (France).

DETERMINATION OF THE FOUCAULT CURRENT COEFFICIENTS AND MAGNETIC HYSTERESIS ENERGY DISSIPATION ONBOARD A SPINNING SATELLITE [DETERMINATION DES COEFFICIENTS LIES AUX DISSIPATIONS D'ENERGIE PAR COURANTS DE FOUCAULT ET HYSTERESIS MAGNETIQUE A BORD D'UN SATELLITE SPINNE]

Josette Runavot Jan. 1976 37 p refs In FRENCH; ENGLISH summary

(CNES-NT-30) Avail: NTIS HC $4.00

A mathematical model for the prediction of the spin rate evolution of a satellite during its orbital life is proposed, based on SRET II satellite data. The spin rate decreases mainly results from electromagnetic interaction with the earth's magnetic field (eddy current and magnetic hysteresis torques). Assuming that all the other ones are negligible, the theoretical investigation of these torques leads to the experimental determination of two coefficients for a given satellite. The results of the method developed are compared with available flight data and it can be concluded that the experimental way is the best suited for the coefficient's identification. Author (ESA)

N76-27324# Centre National d'Etudes Spatiales, Toulouse (France).

INERTIAL NAVIGATION [NAVIGATION PAR INERTIE]

Cornelis vanderLinden Feb. 1976 36 p refs In FRENCH; ENGLISH summary

(CNES-NT-32) Avail: NTIS HC $4.00

Guidance, control, and navigation are discussed, using the launching of a satellite as a typical case. The principal possibilities for the realization of an inertial navigation (strapped down or gimballed platform) are explained. The functioning of the inertial platform system in particular is described by considering the method of platform stabilization, the principle of operation of the integrating rate gyroscope, the measurement of acceleration, and the alignment process of the instrument cluster with particular reference to the method of gyro compassing. Author (ESA)

N76-27325# Centre National d'Etudes Spatiales, Toulouse (France).
STARLETTE: SATELLITE LASER TELEMETRY [STARLETTE - LA TELEMETRIE LASER SUR SATELLITE]
Magdeleine Dinguirard (ONERA, Toulouse) Mar. 1976 58 p refs In FRENCH; ENGLISH summary
(CNES-NT-33) Avail: NTIS HC $4.50

The different significant parameters in laser rangefinding are reviewed in the context of the Starlette project. Starlette is a 24 cm diameter and 47 kg sphere covered with 60 retroreflectors and placed on a 800 km mean altitude quasi circular orbit. The different formulas giving the number of photons received at the ground station were compared and the characteristics of the retroreflectors (size, angular correction and optical qualities) depending on the project were studied. It is concluded that with the stations actually being developed it is possible to obtain a precision in distance measurement of 15 cm. Author (ESA)

N76-27326# Centre National d'Etudes Spatiales, Toulouse (France).
CALCULATION OF THE ORBIT RESULTING FROM A CONTINUOUS THRUST WITH FIXED DIRECTION [CALCUL DE L'ORBITE OBTENUE APRES UNE CORRECTION EFFECTUEE A POUSSEE ET DIRECTION CONSTANTES]
Paul Legendre Apr. 1976 15 p In FRENCH; ENGLISH summary
(CNES-NT-35) Avail: NTIS HC $3.50

An analytical formula to compute the orbit of a satellite after a continuous thrust with a fixed direction and a constant thrust level was derived. It is proven that the correction may be represented by two impulses in the same direction as the thrust: one on the velocity vector, and the other on the position vector. The moduli of these were computed from the technological characteristics of the spacecraft. The solution derived was compared with a numerical integration technique and is exemplified with the diagnostics of the apogee maneuver of Symphonie A. Author (ESA)

N76-27327# European Space Agency, Paris (France).
SATELLITE VIDEO AND SOUND BROADCASTING. TECHNICO-ECONOMIC CONSIDERATIONS FOR INDUSTRIALIZED AND DEVELOPING COUNTRIES [RADIODIFFUSION VISUELLE ET SONORE PAR SATELLITE. CONSIDERATIONS TECHNICO-ECONOMIQUES APPLICABLES AUX PAYS INDUSTRIALISES ET A CEUX EN VOIE DE DEVELOPPEMENT]
C. Rosetti 1975 5 p In FRENCH Presented at the Telecom. 75 Conf., Geneva, 6-8 Oct. 1975
Avail: NTIS HC $3.50

Reasons are given for introducing broadcasting satellites in industrialized and developing countries. Choice of the frequency band is discussed from a systems economics viewpoint. National coverage is seen as the most probable coverage. Possible ground receivers are reviewed with regard to performance and costs. The importance of international cooperation is underlined. ESA

N76-27328# European Space Research and Technology Center, Noordwijk (Netherlands).
AEROSAT AND MAROTS: TWO MOBILE COMMUNICATION SATELLITES
J. A. vandenKerckhove 1975 7 p Presented at the 11th Intern. Symp. on Space Technol. and Sci., Tokyo, 30 Jun. - 5 Jul. 1975
Avail: NTIS HC $3.50

The Aerosat and Marots missions are described. Aerosat is an aeronautical satellite program permitting experimentation and evaluation of aircraft/ground communications, surveillances, and wideband techniques. Two geostationary satellites will be located over the Atlantic Ocean. Marots will be a maritime stationary communication satellite providing a wide range of experimentation between satellite and ship terminals. The two missions are compared. ESA

N76-27264* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM DATA RECORDS
E. C. Gatz *In its* The Deep Space Network 15 Jun. 1976 p 4-7 refs (For availability see N76-27262 18-12)
CSCL 17B

N76-27276* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM PERFORMANCE WITH CONVOLUTIONALLY CODED DATA: MAXIMUM LIKELIHOOD DECODING Final Report
B. Benjauthrit *In its* The Deep Space Network 15 Jun. 1976 p 112-122 refs (For availability see N76-27262 18-12)
CSCL 17B

N76-27277* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
DSN TELEMETRY SYSTEM PERFORMANCE WITH CONVOLUTIONALLY CODED DATA: SEQUENTIAL DECODING UPDATE
C. A. Greenhall *In its* The Deep Space Network 15 Jun. 1976 p 123-130 ref (For availability see N76-27262 18-12)
CSCL 17B

N76-27283* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. RF Systems Development Section.
DSN DIPLEXER, NOISE BURST TESTING
R. B. Kolbly *In its* The Deep Space Network 15 Jun. 1976 p 199-205 (For availability see N76-27262 18-12)
CSCL 17B

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N76-27329*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TEST MA22 IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-0) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE RCS JET FLOW FIELD INTERACTION, VOLUME 1 Aerothermodynamic Data Report
D. B. Kanipe (NASA. Johnson Space Flight Center) May 1976 811 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147604; DMS-DR-2267-Vol-1) Avail: NTIS HC $21.25 CSCL 22B

A wind tunnel test was conducted in the Langley Research Center 31-inch Continuous Flow Hypersonic Wind Tunnel from May 6, 1975 through June 3, 1975. The primary objectives of this test were the following: (1) to study the ability of the wind tunnel to repeat, on a run-to-run basis, data taken for identical configurations to determine if errors in repeatability could have a significant effect on jet interaction data, (2) to determine the effect of aerodynamic heating of the scale model on jet interaction, (3) to investigate the effects of elevon and body flap deflections on jet interaction, (4) to determine if the effects from jets fired separately along different axes can be added to equal the effects of the jets fired simultaneously (super position effects), (5) to study multiple jet effects, and (6) to investigate area ratio effects, i.e., the effect on jet interaction measurements of using wind tunnel nozzles with different area ratios in the same location. The model used in the test was a .010-scale

model of the Space Shuttle Orbiter Configuration 3. The test was conducted at Mach 10.3 and a dynamic pressure of 150 psf. RCS chamber pressure was varied to simulate free flight dynamic pressures of 5, 7.5, 10, and 20 psf. Author

N76-27330*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TEST MA22 IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-0) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE RCS JET FLOW FIELD INTERACTION, VOLUME 2 Aerothermodynamic Data Report
D. B. Kanipe (NASA. Johnson Space Flight Center) May 1976 802 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147605; DMS-DR-2267-Vol-2) Avail: NTIS HC $21.25 CSCL 22B
For abstract, see N76-27329.

N76-27331*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TEST MA22 IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-0) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE RCS JET FLOW FIELD INTERACTION, VOLUME 3 Aerothermodynamic Data Report
D. B. Kanipe (NASA. Johnson Space Flight Center) May 1976 808 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147606; DMS-DR-2267-Vol-3) Avail: NTIS HC $21.25 CSCL 22B
For abstract, see N76-27329 .

N76-27332*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TEST MA22 IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-0) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE RCS JET FLOW FIELD INTERACTION, VOLUME 4 Aerothermodynamic Data Report
D. B. Kanipe (NASA. Johnson Space Flight Center) May 1976 668 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147607; DMS-DR-2267-Vol-4) Avail: NTIS HC $16.25 CSCL 22B
For abstract, see N76-27329.

N76-27333*# Chrysler Corp., New Orleans, La. Space Div.
AEROHEATING (PRESSURE) CHARACTERISTICS ON A 0.10-SCALE VERSION OF THE VEHICLE 3 SPACE SHUTTLE CONFIGURATION (26-OTS) IN THE LANGLEY RESEARCH CENTER 4-FOOT WIND TUNNEL (IH4)
R. B. Kingsland (Rockwell Intern., Downey, Calif.) May 1976 529 p
(Contract NAS9-13247)
(NASA-CR-144609; DMS-DR-2138-Vol-2) Avail: NTIS HC $13.00 CSCL 22B

Results of wind tunnel tests, conducted at the Langley Research Center Unitary Plan Wind Tunnel, are presented. The model tested was an 0.010-scale version of the Vehicle 3 Space Shuttle Configuration. Pressure measurements were made on the launch configuration, Orbiter alone, external tank alone, and solid rocket booster alone, to provide heat transfer pressure data. The tests were conducted for a Mach number range from 2.36 to 4.6 and Reynolds number range from 1.2 to 5 million per foot. The model was tested at angles of attack from -10 to 20 deg for a sideslip angle range from -5 to +5 deg, and at sideslip angles from -5 to 48 deg for 0 deg angle of attack. Tabulated data are given and photographs of the test configuration are shown. Author

N76-27334*# Chrysler Corp., New Orleans, La. Space Div.
AEROHEATING (PRESSURE) CHARACTERISTICS ON A 0.010-SCALE VERSION OF THE VEHICLE 3 SPACE SHUTTLE CONFIGURATION (26-OTS) IN LANGLEY RESEARCH CENTER 4-FOOT WIND TUNNEL (IH4)
R. B. Kingsland (Rockwell Intern., Downey, Calif.) May 1976 473 p
(Contract NAS9-13247)
(NASA-CR-144610; DMS-DR-2138-Vol-3) Avail: NTIS HC $12.00 CSCL 22B
For abstract, see N76-27333.

N76-27335*# Chrysler Corp., New Orleans, La. Space Div.
AEROHEATING (PRESSURE) CHARACTERISTICS ON A 0.010-SCALE VERSION OF THE VEHICLE 3 SPACE SHUTTLE CONFIGURATION (26-OTS) IN THE LANGLEY RESEARCH CENTER 4-FOOT WIND TUNNEL (IH4)
R. B. Kingsland (Rockwell, Intern., Downey, Calif.) May 1976 596 p
(Contract NAS9-13247)
(NASA-CR-144611; DMS-DR-2138-Vol-4) Avail: NTIS HC $13.75 CSCL 22B
For abstract, see N76-27333.

N76-27336*# Sperry Flight Systems, Phoenix, Ariz.
MAGNETIC BEARING REACTION WHEEL Final Report
A. Sabnis, F. Schmitt, and L. Smith Feb. 1976 85 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954143)
(NASA-CR-148315; Publ-71-0853-00-00) Avail: NTIS HC $5.00 CSCL 22B

The results of a program for the development, fabrication and functional test of an engineering model magnetically suspended reaction wheel are described. The reaction wheel develops an angular momentum of + or - 0.5 foot-pound-second and is intended for eventual application in the attitude control of long-life interplanetary and orbiting spacecraft. A description of the wheel design and its major performance characteristics is presented. Recommendations for flight prototype development are made. Author

N76-27337*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A RECOVERABLE TUG FOR PLANETARY MISSIONS INCLUDING USE OF PERIGEE PROPULSION AND CORRECTIONS FOR NODAL REGRESSION
Janos Borsody 1976 22 p refs Proposed for presentation at the Astrodynamics Conf., San Diego, Calif., 18 - 20 Aug. 1976; sponsored by AIAA and the Am. Astron. Soc.
(NASA-TM-X-73433; E-8782) Avail: NTIS HC $4.00 CSCL 22B

Mathematical equations are derived by using the Maximum Principle to obtain the maximum payload capability of a reusable tug for planetary missions. The mathematical formulation includes correction for nodal precession of the space shuttle orbit. The tug performs this nodal correction in returning to this precessed orbit. The sample case analyzed represents an inner planet mission as defined by the declination (fixed) and right ascension of the outgoing asymptote and the mission energy. Payload capability is derived for a typical cryogenic tug and the sample case with and without perigee propulsion. Optimal trajectory profiles and some important orbital elements are also discussed. Author

N76-27338*# Chrysler Corp., New Orleans, La. Space Div.
HIGH SUPERSONIC STABILITY AND CONTROL CHARACTERISTICS OF A 0.015-SCALE (REMOTELY CONTROLLED ELEVON) MODEL 49-0 OF THE SPACE SHUTTLE ORBITER TESTED IN THE NASA/LARC 4-FOOT UPWT (LEG 2) (LA63B)
Joe D. Gamble May 1976 267 p
(Contract NAS9-13247)
(NASA-CR-144606; DMS-DR-2279) Avail: NTIS HC $9.00 CSCL 22B

The model tested was a Langley-built 0.015-scale SSV Orbiter model with remote independently operated left and right elevon surfaces. The objective of the test was to generate a detailed aerodynamic data base for the current Shuttle Orbiter Configuration. Special attention was directed to definition of nonlinear aerodynamic characteristics by taking data at small increments, angle of attack, angle of sideslip, and elevon position. Six-component aerodynamic force and moment and elevon position data were recorded over an angle-of-attack range from -4 deg to 45 deg, at angles of sideslip of 0 deg, + or - 2 deg, and + or - 4 deg. Additional tests were made over an angle of sideslip range from -6 deg to 8 deg at selected angles of attack. The test Mach numbers were 2.86, 3.90, and 4.60 with Reynolds number held at a constant two million per foot. Author

N76-27339*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CENTAUR D-1A NOSE FAIRING JETTISON TEST
W. M. Prati Jun. 1976 112 p refs
(NASA-TM-X-73450; E-8808) Avail: NTIS HC $5.50 CSCL 22B

An experimental investigation was conducted to verify the functional and structural capability of the Centaur D-1A nose fairing. A full-scale flight-type nose fairing was jettisoned at the Lewis Research Center Space Power Chamber at simulated altitude. Two complete jettisons of the nose fairing were performed, one without aft helper springs and one with aft helper springs. A "static" rotation test was also performed to verify capability of the helper springs and to allow clearance measurements between the nose fairing and spacecraft envelope mock-up at certain discrete nose fairing rotation angles. Nose fairing trajectories, structural deflections, clearances, and hinge forces during jettison are presented. Data from subsequent Centaur D-1A flights, relative to nose fairing jettisons, are compared with the experimental results. Author

N76-27340*# Operations Research, Inc., Silver Spring, Md.
RESULTS OF PRELIMINARY MICROWAVE MULTI-APPLICATIONS PAYLOAD (MMAP) STUDY
15 Jun. 1975 52 p
(Contract NAS5-24034)
(NASA-CR-144762) Avail: NTIS HC $4.50 CSCL 22B

A preliminary feasibility study of the microwave multi-applications payload (MMAP) system for the Spacelab has been carried out. The initial objectives of this study have been to determine the minimum equipment requirements of the MMAP and the feasibility of placing the numerous large aperture antennas in the Spacelab. The study was begun by reviewing the experimental objectives and techniques and determining areas of commonality. Emphasis was given to the determination of common RF equipment requirements. These requirementers were considered after agreement among the experiments had been reached on limiting the number of frequencies to be used in the system. This was done so that the number of antennas, transmitters, and receivers could be minimized. The electronics system block diagram and the antenna configurations were considered in some details. It was concluded that the MMAP is feasible and can be an economical method of achieving a large number of experimental goals. Author

N76-27341*# Chrysler Corp., New Orleans, La. Space Div.
FORCE TEST OF A 0.88 PERCENT SCALE 142-INCH DIAMETER SOLID ROCKET BOOSTER (MSFC MODEL NUMBER 461) IN THE NASA/MSFC HIGH REYNOLDS NUMBER WIND TUNNEL (SA13F) Aerothermodynamic Data Report
J. D. Johnson (NASA. Marshall Space Flight Center) and G. W. Winkler (Northrop Services, Inc., Huntsville, Ala.) May 1976 193 p refs
(Contract NAS9-13247)
(NASA-CR-144617; DMS-DR-2277) Avail: NTIS HC $7.50 CSCL 22B

The results are presented of a force test of a .88 percent scale model of the 142 inch solid rocket booster without protuberances, conducted in the MSFC high Reynolds number wind tunnel. The objective of this test was to obtain aerodynamic force data over a large range of Reynolds numbers. The test was conducted over a Mach number range from 0.4 to 3.5. Reynolds numbers based on model diameter (1.25 inches) ranged from .75 million to 13.5 million. The angle of attack range was from 35 to 145 degrees. Author

N76-27342*# Chrysler Corp., New Orleans, La. Space Div.
TRANSONIC-SUPERSONIC HIGH REYNOLDS NUMBER STABILITY AND CONTROL CHARACTERISTICS OF A 0.015-SCALE (REMOTELY CONTROLLED ELEVON) MODEL 44-0 OF THE SPACE SHUTTLE ORBITER TESTED IN THE VSD HIGH SPEED WIND TUNNEL (LA67) Aerothermodynamic Data Report
May 1976 892 p refs
(Contract NAS9-13247)
(NASA-CR-144607; DMS-DR-2266) Avail: NTIS HC $21.25 CSCL 22B

A detailed aerodynamic data base which can be used to substantiate the aerodynamic design data book for the current shuttle orbiter configuration was generated. Special attention was directed to definition of non-linear aerodynamic characteristics by taking data at small increments in the angle of attack, angle of sideslip, Mach number, and elevon position. Six-component aerodynamic force and moment and elevon position data were recorded over an angle-of-attack range from -2 deg to as high as 32 deg at angles of sideslip of 0 deg, 1 deg, and +2 deg. The test Mach numbers were 0.60, 0.80, 0.90, 1.2, 1.5, 2.0, 3.0, and 4.6. The effects of Reynolds number were investigated and covered a range from 5.0 to 16.0 million per foot. Author

N76-27343*# Chrysler Corp., New Orleans, La. Space Div.
AN INVESTIGATION TO DETERMINE THE PRESSURE DISTRIBUTION ON THE 0.0137 SCALE SOLID ROCKET BOOSTER FOREBODY (MSFC MODEL 467) AT ANGLES OF ATTACK AT OR NEAR 90 DEG AND HIGH REYNOLDS NUMBERS IN THE MSFC HIGH REYNOLDS NUMBER WIND TUNNEL (SA29F)
Paul E. Ramsey May 1976 138 p ref
(Contract NAS9-13247)
(NASA-CR-147608; DMS-DR-2207) Avail: NTIS HC $6.00 CSCL 22B

An aerodynamic investigation was conducted in the MSFC High Reynolds Number Wind Tunnel to determine the pressure distribution over the foresection of the current 146 inch diameter shuttle SRB. The test model consisted of a 0.0137 scale version of the SRB nose cone and a forward portion of the cylindrical body which was approximately 2.7 calibers in length. The pressure distributions are plotted as a function of longitudinal station ratioed to body diameter and circumferential location for each angle of attack and Mach number. A Reynolds number variation study was made for Mach numbers of 0.4 and 0.6 at an angle of attack of 270 deg and roll angle of 180 deg. Author

N76-27344*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
ELECTROSTATIC CHARGE PHENOMENA RELATED TO THE SHUTTLE ORBITER DESIGN Space Shuttle Avionic System Engineering Support
C. V. Wolfers 19 Dec. 1974 16 p refs
(Contract NAS9-13970)
(NASA-CR-147811; Rept-1.3-DN-C0104-013) Avail: NTIS CSCL 22B

The shuttle orbiter is judged uniquely vulnerable to electrostatic charge hazards because of the high electrical resistivity and large surface areas of its RSI (electrically insulated coating) in close proximity to inherently susceptible solid state digital avionics equipments. Exploratory laboratory tests and analytical predictions of RSI electrostatic behavior suggest a much more severe impulse noise environment than commonly experienced in flight on conventional metallic skinned airplanes. It is recommended that the susceptibility and required electrical isolation of orbiter flight critical avionics be examined and that positive design actions be taken to ensure discharge of the static charge buildup on the orbiter RSI to its substructure and in turn to the atmosphere. Author

N76-27345*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
ROLL MANEUVER EVALUATION Space Shuttle Engineering and Operations Support
W. W. Webb 9 Apr. 1975 22 p refs
(Contract NAS9-13970)
(NASA-CR-147807; Rept-1.3-DN-C0203-006) Avail: NTIS HC $3.50 CSCL 22B

The current roll maneuver to the flight azimuth following lift-off is achieved by commanding roll attitude using a linear profile with no roll rate command. The linearity of this command profile implies an infinite acceleration to a constant roll rate; the vehicle cannot instantaneously achieve this rate, so the actual roll attitude lags the command attitude throughout the maneuver. The roll attitude error which thus develops can be reduced by augmenting the attitude command with a rate command and utilizing finite slopes on the rate command to give the vehicle time to accelerate. Results obtained from commanding various

roll attitude and rate combinations to perform the maneuver are presented. Author

N76-27346*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FAILURE RATE ANALYSIS OF GODDARD SPACE FLIGHT CENTER SPACECRAFT PERFORMANCE DURING ORBITAL LIFE
H. P. Norris and A. R. Timmins Washington Jul. 1976 16 p refs
(NASA-TN-D-8272; G-7681) Avail: NTIS HC $3.50 CSCL 22B

Space life performance data on 57 Goddard Space Flight Center spacecraft are analyzed from the standpoint of determining an appropriate reliability model and the associated reliability parameters. Data from published NASA reports, which cover the space performance of GSFC spacecraft launched in the 1960-1970 decade, form the basis of the analyses. The results of the analyses show that the time distribution of 449 malfunctions, of which 248 were classified as failures (not necessarily catastrophic), follow a reliability growth pattern that can be described with either the Duane model or a Weibull distribution. The advantages of both mathematical models are used in order to: identify space failure rates, observe chronological trends, and compare failure rates with those experienced during the prelaunch environmental tests of the flight model spacecraft. Author

N76-27347# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
ARIANE PASSENGER OF THE DFVLR. DRAFT STUDY [ARIANE-PASSENGER DER DFVLR - KONZEPTSTUDIE]
A. Pietrass, J. Puls et al [1975] 76 p In GERMAN
(DLR-IB-552-75/19) Avail: NTIS HC $5.00

A proposal is made for an Ariane launch vehicle payload satellite containing technological and scientific experiments. Technological experiments proposed are: a three axis altitude system, a star field sensor, an ion direction sensor, an RF position sensor, time measurement equipment, a hydrasine propulsion unit, and a modular telemetry-telecommand system. Scientific experiments are: measurement of the geocoronal and interplanetary scattered radiation in the UV and investigation of the plasmapause. The configuration of the passenger satellite is detailed, and a mission plan described. ESA

N76-27348# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
ARIANE PASSENGER SATELLITE FOR TESTING ION ENGINES. DRAFT STUDY OF THE DFVLR CONCERNING A TECHNOLOGICAL PAYLOAD IN THE ARIANE TEST PROGRAM [ARIANE PASSAGIER SATELLITE ZUR ERPROBUNG VON IONENTRIEBWERKEN - KONZEPTSTUDIE. VORSCHLAG DER DFVLR FUER EINE TECHNOLOGISCHE NUTZLAST IM ARIANETESTPROGRAMM]
A. Pietrass, J. Puls et al [1975] 55 p In GERMAN
(DLR-IB-552-75/20) Avail: NTIS HC $4.50

A proposal is made for Ariane launch vehicle payloads: Ariane Passenger Satellite (APS). This satellite's main purpose is the orbital testing of the RIT - 10 ion engine, including solar generator, RF altitude sensor, molecular telemetry system. A mission definition is given for the APS, the apogee engine is described, and concepts are outlined for the satellite configuration and subsystems. Alternative configurations are mentioned, and costs are estimated. ESA

N76-27349# Rome Univ. (Italy). Inst. of Aeronautical Constructions.
LAUNCHING TECHNIQUE OF ARTIFICIAL PLANETS [LA TECNICA DI LANCIO DEI PIANETI ARTIFICIALI]
Michele Sirinian Jan. 1974 100 p refs In ITALIAN; ENGLISH summary
(Rept-39) Avail: NTIS HC $5.00

A general method is presented, based on previous studies of specific projects, for planning an interplanetary mission with particular regard to solar probes. Once the mission, the weight of the solar probe, the available launch vehicle performances, and the geographical coordinates of the launching site are fixed according to the method, it is possible to determine launching time, launching direction, and ascent trajectory to the desired heliocentric orbit. The restrictions imposed by the launching site, the launch vehicle, and the effects of deviations (errors) from nominal launch conditions are also examined and evaluated. Author (ESA)

N76-27350# Rome Univ. (Italy). Inst. of Aeronautical Constructions.
ON THE POSSIBILITY OF DEVELOPING A SIMPLE SOLAR PROBE STABILIZED BY RADIATION PRESSURE. PRINCIPAL CHARACTERISTICS, PROJECT CRITERIA, STUDY OF MOTION AND STABILITY [SULLA POSSIBILITA DI REALIZZARE UNA SONDA SOLARE SEMPLICE STABILIZZATA MEDIANTE LA PRESSIONE D'IRRAGGIAMENTO. CARATTERISTICHE PRINCIPALI, CRITERI DI PROGETTAZIONE, STUDIO DEL MOTO E DELLA STABILIZZAZIONE]
Michele Sirinian Mar. 1974 32 p refs In ITALIAN; ENGLISH summary
(Rept-40) HC $4.00

A proposal for a cone shaped solar probe is made in which the thermal equilibrium, the production of the energy for instrumentation requirements, and the attitude stability may be obtained in a natural way by properly assigning geometrical dimensions, mass distribution, materials and colors of outer surface. The proposed solution outlines a very simple and light-weight solar probe which can be injected into an heliocentric orbit at a moderate cost. In particular, motion and stability equations of the solar probe with some applications to specific cases are presented. Author (ESA)

N76-27351# European Space Agency, Paris (France).
CALORIMETRIC DETERMINATION OF THE INFRARED REFLECTIVITY OF A COLD WALL AT 80K
Willi Hallmann et al Feb. 1976 37 p Transl. into ENGLISH of 'Kalorimetrische Bestimmung des Infrarot-Reflexionsvermoegens einer Kaltwand bei 80 K', DFVLR, Porz, West Ger. Report DLR-FB-74-66, 29 Oct. 1974 Original German report available from DFVLR, Porz, West Ger. DM 16,90
(ESA-TT-241; DLR-FB-74-66) Avail: NTIS HC $4.00

Test methods at 80 K and at a pressure of 0.0001 are described. For the tests the Industrial Equipment Manufacturing Company's infrared simulation and thermal vacuum facility were used. The reflectivity was measured direct and from the equilibrium temperatures, in connection with the German-American Helios solar probe project. ESA

N76-27352# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
THE ATTITUDE CONTROL OF THREE-AXIS STABILISED SPACECRAFT WITH FLEXIBLE APPENDAGES, VOLUME 1 Final Report
R. S. Harris, D. C. Todman, and N. Swift Mar. 1976 183 p refs 3 Vol.
(Contract ESTEC-2312/74-AK)
(ESS/SS-695-Vol-1; ESA-CR(P)-808-Vol-1) Avail: NTIS HC $7.50

Methods of deriving the dynamic equations of motion of three-axis stabilized satellites with large flexible solar arrays and/or antennas, described in literature, are compared and summarized. Approaches adopted for analyzing flexible structures are discussed and their impact on the formulation of the dynamic equations is considered. A discussion of papers describing the design and synthesis of a suitable control law for a three-axis stabilized satellite with flexible appendages is presented. ESA

N76-27353# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
THE ATTITUDE CONTROL OF THREE-AXIS STABILISED SPACECRAFT WITH FLEXIBLE APPENDAGES, VOLUME 2, BOOK 1 Final Report
R. S. Harris and D. C. Todman Mar. 1976 196 p 3 Vol.
(Contract ESTEC-2312/74-AK)
(ESS/SS-695-Vol-2-Bk-1; ESA-CR(P)-808-Vol-2-Bk-1) Avail: NTIS HC $7.50

The flexure-satellite attitude interaction due to two uniform

beam arrays on a three-axis stabilized spacecraft is examined. The arrays are equivalent in mass and inertia distribution to 18 m x 2 m RAE-type arrays, being symmetrically disposed about the satellite roll/yaw plane and offset from the pitch axis. Three control actuators are used: thrusters, DGMW, and reaction wheels. On the assumption of a rigid structure, and after introduction of flexure dynamics, it is demonstrated that the performance degradation due to flexure in the pitch loops is negligibly small so that the three pitch controllers designed on the basis of a rigid satellite are adequate. This is also the situation for the roll/yaw loop of the DGMW system. In the case of the thruster roll and yaw loops, an increase in the number of thruster firings occurs; however, flexure interaction with the reaction wheel roll and yaw axes causes instability. ESA

N76-27354# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
THE ATTITUDE CONTROL OF THREE-AXIS STABILISED SPACECRAFT WITH FLEXIBLE APPENDAGES, VOLUME 2, BOOK 2 Final Report
R. S. Harris and D. C. Todman Mar. 1976 202 p refs 3 Vol.
(Contract ESTEC-2312/74-AK)
(ESS/SS-695-Vol-2-Bk-2; ESA-CR(P)-808-Vol-2-Bk-2) Avail: NTIS HC $7.75

The flexure-satellite attitude interaction due to two uniform beam arrays on a three-axis stabilized spacecraft is examined. It is shown that flexure interaction with the reaction wheel roll and yaw axes causes instability. Improved control schemes which take flexure into account were therefore derived for the reaction wheel actuator system. Both classical and modern control techniques are employed resulting in the design of a compensation network and two observer-based multivariable feedback controllers. The result of a comparison of the three systems is that best control performance is given by an observer which is used to provide control signals for the rigid body mode, allowing the flexure mode to decay by structural damping. Methods of implementing in-flight experiment and data processing techniques to evaluate flexure parameters are compared. ESA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N76-27355*# TRW Systems, Redondo Beach, Calif.
CHARGED PARTICLE MEASUREMENTS ON A 30-CM DIAMETER MERCURY ION ENGINE THRUST BEAM
J. M. Sellen, Jr., G. K. Komatsu, D. K. Hoffmaster, and R. F. Kemp 1 Apr. 1974 36 p refs
(Contract NAS3-17641)
(NASA-CR-148293; TRW-25781-6001-RU-00) Avail: NTIS HC $4.00 CSCL 21C

Measurements of both thrust ions and charge exchange ions were made in the beam of a 30 centimeter diameter electron bombardment mercury ion thruster. A qualitative model is presented which describes magnitudes of charge exchange ion formation and motions of these ions in the weak electric field structure of the neutralized thrust beam plasma. Areas of agreement and discrepancy between observed and modeled charge exchange properties are discussed. Author

N76-27356*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
COMMONALITY STUDY OF THE PRESSURE-VOLUME-TEMPERATURE BASED PROPELLANT GAGING SOFTWARE MODULES FOR THE AUXILIARY POWER UNIT, REACTION CONTROL SYSTEM, AND ORBITAL MANEUVERING SYSTEM
D. D. Duhon 20 Mar. 1975 14 p refs
(Contract NAS9-13970)
(NASA-CR-147808) Avail: NTIS HC $3.50 CSCL 22B

Computer storage requirements can be reduced if areas of commonality exist in two or more programs placed in the same computer and identical code can be used by more than one program. The pressure-volume-temperature (P-V-T) relationship for the propellant tank pressurant agent is utilized as the basis for either a primary of a backup propellant gaging program for the auxiliary power unit (APU), the reaction control system (RCS), and the orbital maneuvering system (OMS). These three propellant gaging programs were investigated. It was revealed that a very limited degree of software commonality exits among them. An examination of this common software indicated that only the computation of the helium compressibility factor in an external function subprogram accessible to both the RCS and OMS propellant gaging programs appears to offer a savings in computer storage requirements. Author

N76-27357*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
ENTRY REACTION CONTROL SYSTEM PROPELLANT ANALYSIS. FLIGHT CONTROL INTEGRATION
O. R. DeVall 12 Feb. 1975 8 p refs
(Contract NAS9-13970)
(NASA-CR-147812) Avail: NTIS HC $3.50 CSCL 22B

The effects of winds, sideslip angle feedback, and the data reference (air or inertial) on the Reaction Control System (RCS) propellant requirements during entry were investigated. It was determined that in the presence of a 3 sigma crosswind an addition 188 pounds of RCS propellant was required for entry control which is within the present 200 pound allotment for winds. The absence of air data information does result in slightly higher RCS propellant demands. Author

N76-27358# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.
ANALYTIC MASS MODEL OF CHEMICAL ROCKET STAGES FOR SPACE FLIGHT MISSIONS. PART 2: LONG DURATION MISSIONS
Juergen Broschk, Maurice M. Bunn, and Detlef Manski 26 Feb. 1976 46 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-17) Avail: NTIS HC $4.00; DFVLR, Cologne DM 18,60

Approximation equations were derived to design optimal propellant insulation systems for transfer stages. Propellant, mission duration, thermal environment, insulating material, transfer stage design, and the orientation of the stage to the heat source are independent parameters for the computations. An optimized proportion of insulation mass and vaporized propellant mass is obtained. Maximum payload capacity is the optimizing criteria where the total mass and velocity requirement of the stage are given. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N76-27359*# Virginia Polytechnic Inst., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR ANALYSIS OF LAMINATED FIBROUS COMPOSITES Ph.D. Thesis
Gary D. Renieri and Carl T. Herakovich Jun. 1976 193 p refs
(Grant NGR-47-004-090)
(NASA-CR-148317; VPI-E-76-10) Avail: NTIS HC $7.50 CSCL 11D

A computerized analysis of the nonlinear behavior of fibrous composite laminates including axial loading, thermal loading, temperature dependent properties, and edge effects is presented. Ramberg-Osgood approximations are used to represent lamina stress-strain behavior and percent retention curves are employed to model the variation of properties with temperature. Balanced, symmetric laminates comprised of either boron/epoxy, graphite/epoxy, or borsic-aluminum are analyzed using a quasi-three-dimensional finite element analysis. Results are presented for the interlaminar stress distributions in cross-ply, angle-ply, and more complex laminates. Nonlinear stress-strain curves for a variety of composite laminates in tension and compression are obtained and compared to other existing theories and experimental results. Author

N76-27360*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
OPTIMUM DESIGN OF COMPOSITE LAMINATES WITH THERMAL EFFECTS M.S. Thesis
Larry R. Markham and Carl T. Herakovich Jun. 1976 110 p refs
(Grant NGR-47-004-129)
(NASA-CR-148318; VPI-E-76-11) Avail: NTIS HC $5.50 CSCL 11D

An analytical approach to determine an optimum laminate for a variety of thermal and mechanical loading combinations is presented. The analysis is performed for a linear elastic material under static mechanical and uniform thermal loadings. The problem is restricted to a unit width and length laminate with angle orientations resulting in an orthotropic, symmetric, and balanced configuration. An objective function defining total strain energy, is formulated and an optimum laminate design determined subject to constraints on stiffness, average coefficient of thermal expansion, and strength. The objective function is formulated in terms of the orientation angles, number of plies, and material properties. The method presented has, in varying degrees, shown that the design of a laminate can be accomplished using strain energy minimization as the primary criteria. The results of various combinations of applied constraints in the optimized design process are presented and discussed. Author

N76-27361*# IIT Research Inst., Chicago, Ill.
EVALUATION OF HYBRID COMPOSITE MATERIALS IN CYLINDRICAL SPECIMEN GEOMETRIES Final Report, 23 Aug. 1973 - 31 Mar. 1976
T. Liber and I. M. Daniel 31 Mar. 1976 105 p refs Sponsored in part by AMRDL
(Contract NAS1-12645)
(NASA-CR-145006; IITRI-D6089) Avail: NTIS HC $5.50 CSCL 11D

Static and fatigue properties of three composite materials and hybrids were examined. The materials investigated were graphite/epoxy, S-glass/epoxy, PRD-49 (Kevlar 49)/epoxy, and hybrids in angle-ply configurations. A new type of edgeless cylindrical specimen was developed. It is a flattened tube with two flat sides connected by curved sections and it is handled much like the standard flat coupon. Special specimen fabrication, tabbing, and tab region reinforcing techniques were developed. Axial modulus, Poisson's ratio, strength, and ultimate strain were obtained under static loading from flattened tube specimens of nine laminate configurations. In the case of graphite/epoxy the tubular specimens appeared to yield somewhat higher strength and ultimate strain values than flat specimens. Tensile fatigue tests were conducted with all nine types of specimens and S-N curves obtained. Specimens surviving 10 million cycles of tensile loading were subsequently tested statically to failure to determine residual properties. Author

N76-27362*# Scientific Translation Service, Santa Barbara, Calif.
PHASE DIAGRAM OF THE SYSTEM Al2O3-La2O3 AT ELEVATED TEMPERATURE
M. Mizuno, R. Berjoan, J. P. Coutures, and M. Foex Washington NASA Jun. 1976 16 p refs Transl. into ENGLISH from Yogyo Kyokai Shi (Japan), vol. 82, no. 12, 1974 p 631-636
(Contract NASw-2791)
(NASA-TT-F-17070) Avail: NTIS HC $3.50 CSCL 11D

The solidification points of the Al2O3-La2O3 system were obtained from cooling curves, using a solar furnace. Results different from those reported previously were obtained with the composition of 99.0 - 60.0 mol% La2O3. By microscopic high temperature X-ray diffractometry and cooling curve observations, the presence of a new compound R phase was confirmed at the composition 80.0 mol% La2O3. From these results, a high temperature equilibrium phase diagram for the Al2O3-La2O3 system was inferred. Author

N76-27363*# Scientific Translation Service, Santa Barbara, Calif.
PHASE DIAGRAM OF THE SYSTEM Al2O3-CeO2 AT LIQUIDUS TEMPERATURE
M. Mizuno, R. Berjoan, J. P. Coutures, and M. Foex Washington NASA Jun. 1976 20 p refs Transl. into ENGLISH from J. Ceram. Ass. Jap. (Japan), vol. 83, no. 2, 1975 p 90-96
(Contract NASw-2791)
(NASA-TT-F-17071) Avail: NTIS HC $3.50 CSCL 11D

The liquidus curve in the system Al2O3-CeO2 was determined using a heliostat type solar furnace. The cooling curves of melted specimens were obtained in the black body centrifugal cavity with an optical pyrometer. The quenched specimens were examined by powder X-ray techniques and petrographic microscopy. Anomalies in the liquidus curve of the system were found in the regions between 70.0 and 95.0 mol% CeO2. A composition of 90.0 mol% CeO2 was further examined by the high temperature powder X-ray diffractometry, and the presence of a new orthorhombic phase was established. A tentative phase diagram for the Al2O3-CeO2 system at high temperatures is presented. Author

N76-27364*# Rockwell International Corp., Anaheim, Calif. Autonetics Group.
INVESTIGATION OF LOW COST, HIGH RELIABILITY SEALING TECHNIQUES FOR HYBRID MICROCIRCUITS, PHASE 1 Final Report
K. L. Perkins and J. J. Licari Apr. 1976 67 p refs
(Contract NAS8-31517)
(NASA-CR-144339) Avail: NTIS HC $4.50 CSCL 11A

A preliminary investigation was made to determine the feasibility of using adhesive package sealing for hybrid microcircuits. Major effort consisted of: (1) surveying representative hybrid manufacturers to assess the current use of adhesives for package sealing; (2) making a cost comparison of metallurgical versus adhesive package sealing; (3) determining the seal integrity of gold plated flatpack type packages sealed with selected adhesives, thermal shock, temperature cycling, mechanical shock, and constant acceleration test environments; and (4) defining a more comprehensive study to continue the evaluation of adhesives for package sealing. Results showed that 1.27 cm square gold plated flatpack type packages sealed with the film adhesives and the paste adhesive retained their seal integrity after all tests, and that similarly prepared 2.54 cm square packages retained their seal integrity after all tests except the 10,000 g's constant acceleration test. It is concluded that these results are encouraging, but by no means sufficient to establish the suitability of adhesives for sealing high reliability hybrid microcircuits. Author

N76-27365*# Boeing Aerospace Co., Seattle, Wash.
DEVELOPMENT OF POLYPHENYLQUINOXALINE GRAPHITE COMPOSITES Final Report
Jose D. Shdo Jun. 1976 54 p refs
(Contract NAS3-18927)
(NASA-CR-135041) Avail: NTIS HC $4.50 CSCL 11D

Six polyphenylquinoxalines (PPQ) containing pendant cyano (CN) groups were synthesized. The polymers were characterized

in terms of inherent viscosity, glass transition temperature, softening temperature and weight loss due to aging in air at 316 C (600 F). The potential for crosslinking PPQs by trimerization of pendant CN groups was investigated. A polymer derived from 1 mole 3,3,4,4 -tetraaminobenzophenone, .2 mole p-bis(p -cyanophenoxyphenylglyoxalyl)benzene and .8 mole p-bis (phenylglyoxalyl)benzene was selected for more extensive characterization in HM-S graphite fiber-reinforced composites. Mechanical properties were determined using composites made from HM-S fiber and polymer and composites made from HM-S fiber, polymer and a potential CN group trimerization catalyst. Composite mechanical properties, inter-laminar shear strength and flexure properties, were determined over the temperature range of +21 C to 316 C. Author

N76-27366*# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.

A METAL SHEET STIFFENED BY A PARTIALLY DEBONDED COMPOSITE QUARTER-PLATE

K. Arin Jun. 1976 16 p refs

(Grant NsG-1178)

(NASA-CR-148454) Avail: NTIS HC $3.50 CSCL 11D

An isotropic sheet stiffened by means of an orthotropic quarter-plate is considered. The quarter-plate is assumed to be perfectly bonded to the metal sheet everywhere except an area of debonding which may develop due to high stress concentrations. The adhesive which has a small constant thickness is treated as a shear spring. The loads are applied at infinity and supposed to be transmitted through the metal plate. Shear stress distribution between the two plates was obtained from the continuity of displacements along an area where they were bonded to each other. Author

N76-27367# Polish Academy of Sciences, Warsaw.

AN EVALUATION OF THE DYNAMIC CHARACTERISTICS OF ADHESIVE-ELASTIC ANISOTROPIC COMPLEX MATERIALS [OCENA DYNAMICZNYCH WLASNOSCI LEPKOSPREZYSTYCH ANIZOTROPOWYCH MATERIALOW ZLOZONYCH]

Stanislaw Tokarzewski 3 Oct. 1975 99 p refs In POLISH

Avail: NTIS HC $4.50

A variational method of describing the mechanical characteristics of anisotropic composites which are linearly adhesive-elastic and in a state of harmonic oscillation is formulated and used to calculate the limits for effective moduli and dynamic suppleness. The solutions are illustrated by four examples of numerical calculations of the limits of dynamic moduli calculated for two-component composites of linearly adhesive-elastic materials composed of materials with isotropic characteristics regularly anisotropic as well as transversally isotropic. Author

N76-27368*# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.

INVESTIGATION OF THERMAL FATIGUE IN FIBER COMPOSITE MATERIALS Final Report

Abdel A. Fahmy and Thomas G. Cunningham Washington Jul. 1976 61 p refs

(Grant NGR-34-002-180)

(NASA-CR-2641) Avail: NTIS HC $4.50 CSCL 11D

Graphite-epoxy laminates were thermally cycled to determine the effects of thermal cycles on tensile properties and thermal expansion coefficients of the laminates. Three 12-ply laminate configurations were subjected to up to 5,000 thermal cycles. The cumulative effect of the thermal cycles was determined by destructive inspection (electron micrographs and tensile tests) of samples after progressively larger numbers of cycles. After thermal cycling, the materials' tensile strengths, moduli, and thermal expansion coefficients were significantly lower than for the materials as fabricated. Most of the degradation of properties occurred after only a few cycles. The property degradation was attributed primarily to the progressive development of matrix cracks whose locations depended upon the layup orientation of the laminate. Author

N76-27369# California Univ., Livermore. Lawrence Livermore Lab.

LLL SPHERE-WINDING MACHINE

J. P. Mahler and R. T. Bradley 16 Oct. 1975 16 p refs

(Contract W-7405-eng-48)

(UCRL-51934) Avail: NTIS HC $4.00

To meet the needs of a National Aeronautics and Space Administration (NASA) research contract to determine optimum winding patterns for high-efficiency (maximum strength/minimum weight), composite-material, spherical pressure vessels, LLL has designed a highly flexible, computer-controlled filament-winding machine. This four-axis, fully programmable machine precisely winds filaments impregnated with polymeric material around spherical forms ranging from 8 to 40 cm (3 to 15 in.) in diameter. In addition, it allows winding patterns and parameters (e.g., pitch, position, bandwidth) to be changed quickly and easily, even during the winding operation. The desired change is simply entered into the unit's interactive, high-level language control program. Author (ERA)

N76-27370# California Univ., Livermore. Lawrence Livermore Lab.

FIBER COMPOSITES FOR ENERGY STORAGE FLYWHEELS

L. Penn and T. T. Chiao 7 Oct. 1975 21 p refs Presented at the 31st Ann. Conf. of the Soc. of the Plastics Ind., Washington, D. C.

(Contract W-7405-eng-48)

(UCRL-76891; Conf-760201-1) Avail: NTIS

The flywheel is an intrinsically efficient storage system. When made of high strength-to-weight fiber composites, it can be a portable, safe, and economically feasible means of supplying energy. The potential applications, existing materials studies, and current activities in fiber composite flywheel research are reviewed. Work with fiber composites is reported. Author (ERA)

N76-27371# Sandia Labs., Albuquerque, N.Mex.

EFFECTIVE THERMAL DIFFUSIVITY FOR A MULTIMATERIAL COMPOSITE LAMINATE

W. P. Schimmel, J. V. Beck, and A. B. Donaldson 1975 27 p refs Presented at the Ann. Meeting of ASME, Houston, Tex., 30 Nov. 1975 Sponsored by ERDA

(SAND-75-5390; Conf-751106-10) Avail: NTIS HC $4.50

The development of an effective thermal diffusivity is discussed which can be used to estimate the temperature response at the insulated rear surface of a multilayer composite to a step in temperature at the front surface of the composite. An example is considered using the effective value along with the mathematics of a single layer problem. Results are compared with both an exact solution and an effective diffusivity computed from a lumped parameter model. Author (ERA)

N76-27372# Sandia Labs., Albuquerque, N.Mex.

BORON NITRIDE COMPOSITES BY CHEMICAL VAPOR DEPOSITION

H. O. Pierson Sep. 1975 28 p refs

(Contract AT(29-1)-789)

(SAND-75-0130) Avail: NTIS HC $4.00

Composites of boron nitride (BN) were made by the chemical vapor deposition of a BN matrix on a BN felt fiber substrate. Reactant gases were boron trifluoride and ammonia. The composites had a relatively high density (1.70 g/cu cm), a crystallite size L/sub C/ = 150 A, and an interlayer spacing d sub 002 = 3.35 A. Measurements of elastic modulus and thermal conductivity and expansion showed some anisotropy as a result of the preferred fiber orientation of the substrate. Author (ERA)

N76-27373# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.

INVESTIGATION INTO THE IMPROVEMENT OF THE FILLETING PROPERTIES OF SHELL RESIN DX 231/137 ON ALUMINIUM ALLOY HONEYCOMB MATERIALS

L. M. Godfried 12 Feb. 1974 10 p

(FOK-R-1757) Avail: NTIS HC $3.50

The optimization of resin system DX 231/137 aluminum alloy honeycomb adhesion was investigated using Aerosil, a resin thickening additive which could modify the resin system just enough to prevent it from running down the surfaces of the honeycomb material. Flatwise tensile tests were carried out on glass fabrics and carbon prepreg made, respectively, of 5.670 glasscloth and HT-S carbon fiber impregnated with DX 231/137/8 % Aerosil 380 and B-staged at 80 C. A reasonable

flatwise tensile strength on aluminum honeycomb can be achieved with epoxy resin DX-231/137 impregnated in glass fabric if 8 % Aerosil is added to the resin/hardener mixture and if 1H B-staging at 80 C is carried out prior to the curing cycle. Further investigations with carbon fiber are suggested. ESA

N76-27374# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
ELECTRICAL PROPERTIES OF EPOXY PREIMPREGNATED KEVLAR-49 FIBRE MATERIAL F 180.10/1581
L. M. Godfried 25 Apr. 1974 7 p
(FOK-R-1775) Avail: NTIS HC $3.50

The properties were determined for the application of this material instead of glass fabric reinforcement on the F28 radome. The dielectric constant and the loss tangent on a solid laminate, as well as the insertion phase difference and the transmission loss on a sandwich panel were established. It was found that F 180.10/1581 Kevlar-49 is suitable as facing material for the F28 radome with regard to its electrical properties. ESA

N76-27375# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
RELATION BETWEEN FLEXURAL PROPERTIES AND SPAN TO THICKNESS RATIOS OF CARBON FIBRE REINFORCED EPOXY RESIN
L. M. Godfried Aug. 1974 10 p
(FOK-R-1805) Avail: NTIS HC $3.50

To determine the flexural properties of carbon fiber reinforced plastics as a function of span to thickness ratios, a three point loading flexural test was carried out on a CFRP finished with epoxy resins for good compatibility. Flexural tests show that design values for flexural modulus and strength for CFRP material with fiber weight of 55 % are reached at 1 thickness ratio over 40. ESA

N76-27376# Hawker Siddeley Dynamics Ltd., Hatfield (England). Space Div.
THE USE OF CARBON FIBRE REINFORCED PLASTICS IN SATELLITE STRUCTURES, PHASE 2 EXTENSION. VOLUME 1: TECHNICAL REPORT Final Report, Jan. 1973 - Oct. 1975
M. F. Rickett, comp. Feb. 1976 18 p 2 Vol.
(Contract ESTEC-1735/72-PP)
(HSD-TP-7567-Vol-1; ESA-CR(P)-803-Vol-1) Avail: NTIS HC $3.50

Results are presented of work carried out on the thermal testing of an IME type Carbon Fiber Reinforced Plastic (CFRP) boom, thermal and radiation effects on coated CFRP laminates, vibration testing of inserts in CFRP faced honeycombs, and insert failure mechanisms in honeycomb sandwiches. ESA

N76-27377# Hawker Siddeley Dynamics Ltd., Hatfield (England). Space Div.
THE USE OF CARBON FIBRE REINFORCED PLASTICS IN SATELLITE STRUCTURES, PHASE 2 EXTENSION. VOLUME 2: APPENDICES Final Report, Jan. 1973 - Oct. 1975
M. F. Rickett Feb. 1976 231 p refs 2 Vol.
(Contract ESTEC-1735/72-PP)
(HSD-TP-7567-Vol-2; ESA-CR(P)-803-Vol-2) Avail: NTIS HC $8.00

Thermal testing of an IME type Carbon Fiber Reinforced Plastic (CFRP) boom and representative test specimens was undertaken and successfully completed. Degradation of material properties was observed with resultant reduction in the lowest natural frequency of the boom. No damage as the result of differential expansion between the aluminum and the CFRP was observed. Problems of CFRP/aluminum bonding were highlighted and techniques developed to overcome them. Overall performance has added to extreme satisfaction with CFRP in this spacecraft boom application. Author (ESA)

N76-27378# Pennsylvania State Univ., University Park. Dept. of Engineering Science and Mechanics.
A GENERALIZED PLANE STRESS THEORY OF MICRO-STRUCTURE: APPLICATION TO CROSS-PLY LAMINATES Scientific Report, 1 Jan. - 30 Jun. 1975
Jaan Kiusalaas and Bill Moustakakis Jul. 1975 31 p refs
(Grant AF-AFOSR-2590-74; AF Proj. 9782)
(AD-A020660; AFOSR-76-0010TR) Avail: NTIS CSCL 20/11

A previous report by the authors developed a two-dimensional theory of microstructure for angle-ply laminates. Only in-plane loads were considered, and the laminate was assumed to be in a generalized plane state of stress. The present paper explores the application of the theory to cross-ply laminates. A simple example -- the free boundary problem of a homogeneously strained laminate-is used to illustrate theory and evaluate its accuracy. Comparison of the results with a reference solution (obtained by the finite element method) shows that stresses, with two exceptions, display the same degree of correlation that was obtained for the angle-ply construction. Unfortunately, one of the exceptions is the interlaminar normal stress at the middle plane of the laminate, which is considered to have a major influence on delamination failure of the material. It is argued that the discrepancies can be eliminated only by abandoning the generalized plane stress assumption, and admitting bending deformation of the individual layers. Author (GRA)

N76-27379# Avco Corp., Lowell, Mass. Systems Div.
SELF-DIFFUSION IN SILICON NITRIDE Final Technical Report, 1 Jan. 1973 - 31 Mar. 1975
Bernhardt J. Wuensch and Thomas Vasilos 1975 49 p refs
(Contract N00014-73-C-0212; NR Proj. 032-537)
(AD-A021175) Avail: NTIS CSCL 11/2

Results are described for a two-year program intended to develop techniques for simultaneous measurement of Si and N self-diffusion in silicon nitride. A variety of materials were acquired and characterized. The materials examined included both alpha and beta forms of pure Si3N4 plus a variety of 'sialons'. The specimens selected for measurement were a dense, high purity alpha and a dense, commercial-grade beta silicon nitride. GRA

N76-27380# Synsis, Inc., Los Angeles, Calif.
CARBON FIBERS FOR ELECTRICALLY HEATED SYSTEM Final Report, Jun. - May 1975
David Mangelsdorf May 1975 26 p
(Contract DAAK03-74-C-0165; DA Proj. 1T7-62723-AH-98)
(AD-A020952; CE/MEL-151; USA-NLABS-TR-75-120-CEMEL)
Avail: NTIS CSCL 11/4

Characteristics of fibrous carbon materials and techniques for fabricating them into electrically heated systems have been investigated. The inherent characteristics of carbon fibers, yarns, and fabrics and make of composites of carbon with glass fibers have been evaluated by analytical and experimental means. It was found necessary to coat carbon materials with a protective layer of elastomer or other substance to overcome carbon's extremely poor abrasion and kink resistance. Coating of the carbon material reduces its flexibility and increases the difficulty of making electrical attachments to it and making electrically continuous seams. Approaches to alleviating the electrical difficulties were developed, but the poor flexibility of coated carbon fabric or composite fabric tends to make it unsuitable for small, complex assemblies such as handwear. Development of more flexible coatings could reverse this conclusion. Carbon fabrics and/or carbon/glass composite fabrics appear to be ideally suited for relatively large heated assemblies such as vests, casualty bag liners, etc. that these materials may have the other characteristics required for incorporation into personnel clothing as electrical heating elements. This report describes the results of a program designed to (1) evaluate current carbon/graphite fiber technology, (2) survey available fibers, yarns, woven and knitted structures using carbon/graphite fibers; (3) test and evaluate existing and readily fabricated structures for application to personnel heating; and (4) establish interim performance and design requirements for carbon/graphite fiber, electrically-heated personnel protective equipment. GRA

N76-27381# Army Materials and Mechanics Research Center, Watertown, Mass.
ACOUSTIC EMISSION OF GRAPHITE AND BORON FIBER-REINFORCED ALUMINUM COMPOSITES DURING DEFORMATION AND FRACTURE Final Report
Albert F. Grenis and Albert P. Levitt Jun. 1975 24 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-A014937; AMMRC-TR-75-15) Avail: NTIS CSCL 11/4

Experimental acoustic emission techniques of sound detection

and analyses of pulse rate and pulse count as a means of evaluating fiber-reinforced composites are discussed. Since the stress-strain relationship for the composite, before fracture, was also obtained using conventional mechanical tension test equipment, it was possible to detect that region (strain) where significant fiber fracture began for particular composite specimen. The composite materials of interest included graphite fiber-reinforced aluminum alloy 7000, boron fiber-reinforced aluminum alloy 6061, and boron fiber-reinforced aluminum alloy 2024.
Author (GRA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N76-27382 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
HYDROGEN CHLORIDE DETECTION, MEASUREMENT AND MONITORING
D. S. Gaarder, ed. and A. V. Jensen, ed. Dec. 1975 46 p refs
(Contract N00017-72-C-4401)
(AD-A023085; CPIA-PubL-272) Avail: Paper copy available from Chemical Propulsion Information Agency, Laurel, Md. 20810 CSCL 21/9

Results are presented of a comprehensive survey of methods for detecting, measuring and monitoring hydrogen chloride resulting from combustion of propellants containing ammonium perchlorate. Techniques for sampling and analyses, commercially available instruments, and instrument techniques under development are described. The survey is intended to provide information which will allow selection of the optimum measurement technique for a given application. Author

N76-27383* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF PRODUCING I-123 Patent
James W. Blue, inventor (to NASA) Issued 29 Jun. 1976 4 p Filed 13 Mar. 1973 Supersedes N73-20763 (11 - 11, p 1326) Continuation-in-part of abandoned US Patent Appl. SN-247434, filed 25 Apr. 1972
(NASA-Case-LEW-11390-2; US-Patent-3,966,547; US-Patent-Appl-SN-340863; US-Patent-Class-176-11; US-Patent-Class-176-16; US-Patent-Class-423-249; US-Patent-Appl-Sn-247434) Avail: US Patent Office CSCL 07D

Bombarding a cesium heat pipe with high energy particles causes a spallation reaction which produces vapors of Xe-123 and contaminants. The contaminants are removed in a dry ice cold trap while the Xe-123 condenses in a liquid nitrogen trap where it decays to I-123.
Official Gazette of the U.S. Patent Office

N76-27384*# Rockwell International Corp., Anaheim, Calif.
CHEMICAL VAPOR DEPOSITION GROWTH Quarterly Report
R. P. Ruth, H. M. Manasevit, J. L. Kenty, L. A. Moudy, W. I. Simpson, and J. J. Yang 31 Mar. 1976 76 p refs Sponsored in part by ERDA Prepared for JPL
(Contract NAS7-100; JPL-954372)
(NASA-CR-148319; C76-320.1/501; ERDA/JPL-954372-76/1; QR-1) Avail: NTIS HC $5.00 CSCL 07D

A chemical vapor deposition (CVD) reactor system with a vertical deposition chamber was used for the growth of Si films on glass, glass-ceramic, and polycrystalline ceramic substrates. Silicon vapor was produced by pyrolysis of SiH4 in a H2 or He carrier gas. Preliminary deposition experiments with two of the available glasses were not encouraging. Moderately encouraging results, however, were obtained with fired polycrystalline alumina substrates, which were used for Si deposition at temperatures above 1,000 C. The surfaces of both the substrates and the films were characterized by X-ray diffraction, reflection electron diffraction, scanning electron microscopy optical microscopy, and surface profilometric techniques. Several experiments were conducted to establish baseline performance data for the reactor system, including temperature distributions on the sample pedestal, effects of carrier gas flow rate on temperature and film thickness, and Si film growth rate as a function of temperature. Author

N76-27385*# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
CATALYSTS FOR ELECTROCHEMICAL GENERATION OF OXYGEN Semiannual Status Report, 1 Oct. 1975 - 31 Mar. 1976
W. E. OGrady 31 Mar. 1976 48 p refs
(Grant NGR-36-027-050)
(NASA-CR-148156; SASR-8) Avail: NTIS HC $4.00 CSCL 07D

An investigation of more effective catalysts for the electrolytic evolution of oxygen was made to understand the mechanism and kinetics for the electrocatalysis in relation to the surface electronic and lattice properties of the catalyst. An understanding was obtained for the structural features of the electrocatalysts. The kinetics and mechanism of anodic generation of O2 under well defined conditions in relation to the properties of electrode surface were evaluated. B.B.

N76-27386*# Kanner (Leo) Associates, Redwood City, Calif.
NATURE AND UTILIZATION OF IODINE AND BROMINE AS INDICATORS OF OIL-GAS CONTENT
A. V. Kudelskiy, M. F. Kozlov, and G. V. Bogomolov, ed. Washington NASA May 1976 14 p refs Transl. into ENGLISH from the book "Otsenki Perspektiv Neftegazonosnosti Russkoy Platformy" Minsk, Nauka i Tekhnika Press, 1971 p 86-91
(Contract NASw-2790)
(NASA-TT-F-17084) Avail: NTIS HC $3.50 CSCL 07D

A plan is presented for the formation of underground water with high content of iodine, most clearly seen in neotechtonically mobile regions of recent or contemporary downwarping, regions of mud volcanism and intensive formation of scattered organic matter and the production of oil, gas, iodine and other compounds and elements. It was concluded that using iodine as a direct indicator of the presence of oil deposits does not allow for differences in the subsequent fate of the iodine and petroleum.
Author

N76-27387*# Kanner (Leo) Associates, Redwood City, Calif.
ASSOCIATION OF IODINE WITH ORGANIC MATTER AND ITS EVALUATION AS A HYDROGEOCHEMICAL INDEX OF OIL-GAS CONTENT
A. M. Nikanorov Washington NASA May 1976 11 p refs Transl. into ENGLISH from the book "Gidrogeologisheskiye Kriterii Otsenki Perspektiv Neftegazonosnosti Russkoy Platformy" Minsk, Nauka i Tekhnika Press, 1971 p 92-96
(Contract NASw-2790)
(NASA-TT-F-17087) Avail: NTIS HC $3.50 CSCL 07D

An experimental study is presented of the influence of the products of decomposition of vegetable and animal organic matter on the processes of accumulation of iodine, clarifying the possibility of conversion of absorbed iodine to aqueous solutions under various conditions. Furthermore, the possible relationship of iodine with petroleum is determined and an evaluation is given of iodine as an indicator of the prospects for finding oil and gas. Iodine must be considered an indirect hydrogeochemical indicator of oil and gas content, and an increased concentration of iodine in stratal water is looked upon as a favorable factor, indicating a high degree of probability of the presence of conditions facilitating the conservation of initially high concentrations of this microelement; these conditions are also favorable for the conservation of oil and gas accumulations. Author

N76-27388*# Kanner (Leo) Associates, Annapolis, Md.
ABSORPTION OF NITROGEN OXIDE BY SULFURIC ACID SOLUTIONS
A. V. Baranov, E. A. Liberzon, and T. I. Popova Washington NASA May 1976 12 p refs Transl. into ENGLISH from

Trudy Sibirskogo Tekhnologicheskogo Inst. (USSR), vol. 38, 1966 p 77-86
(Contract NASw-2790)
(NASA-TT-F-17088) Avail: NTIS HC $3.50 CSCL 07D

A study was made of the composition of the liquid phase formed upon absorption of nitrogen dioxide by sulfuric acid as a function of the concentration of oxides in the gas, temperature and concentration of sulfuric acid. It was found that in the process of absorption of NO2, mixtures consisting of HNO3 + HNOSO4 + H2SO4 + H2O are formed, containing quite definite maximum concentrations of HNOSO4, dependent on temperature, NO2 concentration in the gas and concentration of absorbing sulfuric acid. This dependence was established. An equation was produced for determination of the maximum concentration of HNOSO4. The possibility is shown of producing mixtures with high HNO3 content by absorption of nitrogen oxides. Author

N76-27389# California Univ., Berkeley. Lawrence Berkeley Lab.
ELLIPSOMETRY OF MASS-TRANSPORT BOUNDARY LAYERS
R. H. Muller and C. G. Smith Sep. 1975 21 p refs Presented at 3d Intern. Conf. on Ellipsometry, Lincoln, Neb., 23 Sep. 1975
(Contract W-7405-eng-48)
(LBL-3929; Conf-750993-1) Avail: NTIS HC $4.50

The effect of mass transport boundary layers, often associated with surface reactions proceeding at high rates, on ellipsometer measurements of the underlying surface was investigated for typical transport conditions in liquids. The effect can be of significant extent and depends primarily on concentration difference across the boundary layer, angle of incidence, and optical constants of the surface. A simplified method for predicting boundary-layer effects based on light refraction is introduced. Computations are in good agreement with experiments.
Author (ERA)

N76-27390# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
TRACE AMMONIA ANALYSIS BY DIRECT GAS CHROMATOGRAPHY
H. S. Bellamy 1975 7 p refs Sponsored by ERDA
(MHSMP-75-24-K) Avail: NTIS HC $4.50

A method was sought by which a gas sample could be analyzed directly for trace quantities of ammonia without the need for cryogenic fractionation or other means of ammonia concentration. Such a method has been developed. Gas chromatography of an as received sample using a Porapak N column and an ultrasonic detector is capable of detecting ammonia down to 150 ppm with an accuracy of +- 10 percent. The method is quite rapid and would lend itself well to analysis of a large number of samples in a short length of time.
Author (ERA)

N76-27391# Sandia Labs., Albuquerque, N.Mex.
STABILITY STUDIES OF H2-F2-O2 MIXTURES AT PRESSURES ABOVE ONE ATMOSPHERE
F. K. Truby Oct. 1975 41 p refs
(Contract AT(29-1)-789)
(SAND-75-0513) Avail: NTIS HC $4.00

The short-term stability measurements of H2--F2--O2 mixtures at near-room temperatures were carried out using an explosion-cell geometry that is similar to the geometry used for the Sandia electron-beam-initiated high-pressure HF laser study. Using an explosion cell designed to withstand pressures of 400 atm, mixing studies were conducted with varying amounts of oxygen, fluorine, and hydrogen in order to establish criteria for gas mixtures that will remain stable for time periods of approximately 15 minutes. Observed explosion-limit pressures of F2 and H2 were determined as a function of oxygen pressure. Data concerning the removal of H2--F2--O2 mixtures from the explosion cell suggests that stability during removal of such mixtures is related to pump-out rates. The cause of certain unexpected detonations is also discussed. Gas mixtures containing H2, F2 and O2 were prepared with total gas pressures of about 10 atm. In certain cases, F2 pressures used were greater than 4,000 torr. Author (ERA)

N76-27392# Columbia Scientific Industries, Austin, Tex. Applied Science Div.
RADIOISOTOPE X-RAY EMISSION SPECTROMETRY FOR MULTIELEMENT ANALYSIS OF AIR PARTICULATES Final Report, Jun. 1971 - Mar. 1975
J. R. Rhodes, A. H. Pradzynski, and R. D. Sieberg Jun. 1975 107 p refs
(Contract AT(40-1)-4205)
(ORO-4205-1) Avail: NTIS HC $5.50

Work was assembled in fifteen papers or specifications which are included as appendices. These appendices cover technique development, instrumentation and applications, standards, interlaboratory comparisons, and reviews. Author (NSA)

N76-27393# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
A LASER DIAGNOSTIC TECHNIQUE FOR THE MEASUREMENT OF DROPLET AND PARTICLE SIZE DISTRIBUTIONS
J. Swithenbank, J. M. Beer, D. S. Taylor, D. Abbott, and G. C. McCreath Dec. 1975 14 p refs
(Grant AF-AFOSR-2682-74; AF Proj. 6813; AF Proj. 9711)
(AD-A021130; AFOSR-76-0068TR) Avail: NTIS CSCL 21/2

In order to verify the various theoretical models of practical combustion systems, experimental measurements are urgently required. A number of laser instrumentation systems which do not disturb the flow are being devised to satisfy this need. This study describes a technique which has been developed for the measurement of droplet or solid particle size distribution. These measurements are required, for example, as the input to mathematical models of combustion which include evaporation. The technique is based on the Fraunhofer diffraction of a parallel beam of mono-chromatic light by the moving droplets. A Fourier transform lens is used to focus a stationary light pattern onto a multielement photo-detector to measure the diffracted light energy distribution. A mini-computer program translates the light energy distribution into the corresponding, unique, droplet size distribution. The droplets or particles are classified into 31 size groups spanning two decades of diameter, (e.g. 5 micrometers to 500 micrometers using a 300 mm focal length Fourier transform lens). GRA

N76-27394# Bell Aerospace Co., Buffalo, N.Y.
TURBULENT MIXING AND COMBUSTION Interim Report
G. Rudinger Nov. 1974 28 p refs
(Contract F44620-70-C-0116; AF Proj. 9711)
(AD-A020694; AFOSR-75-1669TR) Avail: NTIS CSCL 21/2

This report covers the work on gas-particle flow performed during the 1973-1974 contract period. Some previous work, which was published during this period, is briefly reviewed. The main effort was directed toward a study of gas-particle jets injected into a cross flow of clean gas. Photographs of the jets were obtained, and penetration of the jet centerline was correlated with the ratio of the momentum flux of the jet to that of the cross stream, and the distance from the injection point. The loading ratio (particle flow rate/gas flow rate) was 25 for these experiments. Results for lower loading ratios were obtained by a parallel study under different sponsorship. The results and their relationship to the few data available in the literature are discussed. A brief assessment is made for the mean free path for particle-particle collisions in two intersecting gas-particle jets. An extensive review of gas-particle flow was prepared with partial support by this contract, and plans for a future experimental study of a recirculating flow are outlined. GRA

N76-27395# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
ELEMENTARY COMBUSTION REACTION KINETICS MEASUREMENTS OVER LARGE TEMPERATURE RANGES: THE HTFFR TECHNIQUE
Arthur Fontijn (AeroChem. Res. Labs., Inc.) Jan. 1976 13 p refs Presented at the 14th AIAA Aerospace Sci. Meeting, Washington, D. C.
(Contract N00014-75-C-1143; NR Proj. 098-038)
(AD-A020323; SQUID-TR-AC-15-PU; AeroChem-TP-332) Avail: NTIS CSCL 21/2

Proper understanding, prediction and modeling of combustion systems requires reliable knowledge of the reaction mechanisms

and rate coefficients of individual elementary reactions as a function of temperature. This review discusses a unique experimental method for providing such data. This HTFFR method has been used over the 300-1700 K range and is suitable for temperatures up to approx. 2,000 K. The reaction Al + CO2 + AlO + CO is discussed in some detail to illustrate the method, which has thus far been applied to reactions of metal atoms and metal monoxides. A summary of the rate coefficient data obtained in HTFFRs is given and prospects for extensions of the technique to other types of combustion reactions are discussed. Author (GRA)

N76-27396# University of Southern Calif., Los Angeles. Dept. of Mechanical Engineering.
AFOSR CONTRACTORS MEETING ON UNCONFINED DETONATIONS AND FUEL-AIR EXPLOSION RELATED RESEARCH, 1975 Interim Report
Melvin Gerstein Aug. 1975 45 p Meeting held at Eglin AFB, Fla., 20-22 Aug. 1975
(Grant AF-AFOSR-2876-76; AF Proj. 9711)
(AD-A020635; AFOSR-75-0831TR) Avail: NTIS CSCL 21/2

The report consists of a collection of abstracts of the numerous research progress reports given by AFOSR contractors and of invited papers from other governmental agencies and CONUS and European contractors. These papers presented over a two-day period composed the 1975 annual contractors' meeting on combustion dynamics associated with fuel-air explosion phenomena. The principal investigators and their organizational association are also identified. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N76-27397*# Battelle Columbus Labs., Ohio.
COMPILATION OF FATIGUE, FATIGUE-CRACK PROPAGATION, AND FRACTURE DATA FOR 2024 AND 7075 ALUMINUM, Ti-6Al-4V TITANIUM, AND 300M STEEL. VOLUME 1: DESCRIPTION OF DATA AND DATA STORAGE ON MAGNETIC TAPE. VOLUME 2: DATA TAPE (7-TRACK MAGNETIC TAPE) Final Report
Richard C. Rice and J. L. Reynolds Jun. 1976 194 p refs Included as a supplement to this report is volume 2, a 7-track magnetic tape recording of the data compiled in this study. This supplement is available on request from the NASA Scientific and Technical Information Facility
(Contract NAS1-13358)
(NASA-CR-144982) Avail: NTIS HC $7.50 CSCL 11F

Fatigue, fatigue-crack-propagation, and fracture data compiled and stored on magnetic tape are documented. Data for 202 and 7075 aluminum alloys, Ti-6Al-4V titanium alloy, and 300M steel are included in the compilation. Approximately 4,500 fatigue, 6,500 fatigue-crack-propagation, and 1,500 fracture data points are stored on magnetic tape. Descriptions of the data, an index to the data on the magnetic tape, information on data storage format on the tape, a listing of all data source references, and abstracts of other pertinent test information from each data source reference are included. Author

N76-27398*# Scientific Translation Service, Santa Barbara, Calif.
ELECTROCRYSTALLIZATION OF ZINC INFLUENCED BY CODEPOSITION OF LEAD IN ALKALINE SOLUTION
T. Yamashita Washington NASA Jun. 1976 15 p refs Transl. into ENGLISH from J. Chem. Soc. Jap., Ind. Chem. Sect. (Japan), no. 12, 1975 p 2080-2083
(Contract NASw-2791)
(NASA-TT-F-15481) Avail: NTIS HC $3.50 CSCL 11F

Electrodeposition of zinc from the alkaline zincate bath containing a small amount of lead was carried out under galvanostatic and potentiostatic conditions. The lead content of the electrodeposit was determined from polarogram, and electronmicroscopic observation of the deposit was conducted. The lead content of the deposit was 0.1 - 1%, and it was relatively high in the initial stage of low current (C.D. 10 mA/sq cm) electrolysis, while it was almost independent of the cathodic potential. The cathodic polarization increased with an increase in the lead ion content of the bath. Charging or discharging process of the cell was accompanied with deposition or dissolution of zinc, respectively. The charging-discharging cycle was found to be much prolonged by the codeposition of lead. From the results obtained, it was found that the growth of the dendritic deposit of zinc was inhibited by a relatively large amount of codeposited lead. Author

N76-27399*# Scientific Translation Service, Santa Barbara, Calif.
PROPERTIES OF ROLLED SHEET OF Al-Mg2Si MONOVARIANT EUTECTIC ALLOYS
J. Kaneko Washington NASA Jun. 1976 22 p refs Transl. into ENGLISH from J. Jap. Inst. Light Metals (Tokyo), Vol. 25, Aug., 1975 p 303-309
(Contract NASw-2791)
(NASA-TT-F-17076) Avail: NTIS HC $3.50 CSCL 11F

Rolled sheets were prepared from two Al-Mg2Si monovariant eutectic alloys, one with a quasi-binary eutectic composition, the other containing excess Mg. Their metallography, annealing behavior, age hardening, fracture strength, thermal stability and tensile properties are studied. Taking into account their excellent hot workability, it is concluded that these monovariant eutectic alloys can find practical application as wrought Al alloys. Author

N76-27400*# Hughes Helicopters, Culver City, Calif.
DESIGN AND EVALUATION OF THIN METAL SURFACE INSULATION FOR HYPERSONIC FLIGHT
Robert C. Miller and Alexander M. Petach Jun. 1976 45 p refs
(Contract NAS1-13606)
(NASA-CR-144914) Avail: NTIS HC $4.00 CSCL 11F

An all-metal insulation was studied as a thermal protection system for hypersonic vehicles. Key program goals included fabricating the insulation in thin packages which are optimized for high temperature insulation of an actively cooled aluminum structure, and the use of state-of-the-art alloys. The insulation was fabricated from 300 series stainless steel in thicknesses of 0.8 to 12 mm. The outer, 0.127 mm thick, skin was textured to accommodate thermal expansion and oxidized to increase emittance. The thin insulating package was achieved using an insulation concept consisting of foil radiation shields spaced within the package, and conical foil supports to carry loads from the skin and maintain package dimensions. Samples of the metal-insulation were tested to evaluate thermal insulation capability, rain and sand erosion resistance, high temperature oxidation resistance, applied load capability, and high temperature emittance. Author

N76-27401*# Grumman Aerospace Corp., Bethpage, N.Y.
M551 METALS MELTING EXPERIMENT
C. H. Li, G. Busch, and C. Creter Feb. 1976 26 p refs
(Contract NAS8-28728)
(NASA-CR-149927; RM-613) HC $4.00 CSCL 11F

The Metals Melting Skylab Experiment consisted of selectively melting, in sequence, three rotating discs made of aluminum alloy, stainless steel, and tantalum alloy. For comparison, three other discs of the same three materials were similarly melted or welded on the ground. The power source of the melting was an electron beam unit. Results are presented which support the concept that the major difference between ground base and Skylab samples (i.e., large elongated grains in ground base samples versus nearly equiaxed and equal sized grains in Skylab samples) can be explained on the basis of constitutional supercooling, and not on the basis of surface phenomena. Microstructural observations on the weld samples and present explanations for some of these observations are examined. In particular, ripples and their implications to weld solidification were studied. Evidence of pronounced copper segregation in the Skylab A1 weld samples, and the tantalum samples studied, indicates a weld microhardness (and hence strength) that is uniformly higher than the ground base results, which is in agreement with previous predictions. Photographs are shown of the microstructure of the various alloys. Author

N76-27402# Materials Research Labs., Maribyrnong (Australia).
FRAGMENTATION OF AISI 9260 AND HF-1 STEELS: ASSESSMENT OF CO-OPERATIVE R AND D PROJECT

RESULTS USING PAYMAN FRAGMENT ANALYSES
A. J. Bedford Sep. 1975 24 p refs Sponsored in part by US Army
(Rept-634) Avail: NTIS HC $3.50

The Payman and modified Payman fragmentation analysis techniques are used to assess the fragmentation of AISI 9260 and HF-1 steels tested in a cooperative research and development project between the Australian Department of Defense and the United States Department of the Army. It is shown that the fragmentation analyses using the Payman techniques give similar results to the previous methods which used Mott fragment distribution analyses, and similar scaling relationships are obtained. Furthermore, correlations between scaling relationships which use either Mott or Payman fragmentation parameters are investigated, and it is shown that transposition from one type of relationship to the other is possible. Author

N76-27403# Pratt and Whitney Aircraft, Middletown, Conn. Advanced Nuclear Engineering Lab.
PROGRAM COST ESTIMATE FOR ADVANCED HIGH TEMPERATURE MATERIALS. FISCAL YEARS, 1965 - 1966
29 May 1964 28 p
(Contract AT(30-1)-2789)
(CNLM-5716) Avail: NTIS HC $4.00

Costs are summarized for research programs on Nb-Zr-C metallurgy, low-density liquid alloys, nonaging Nb alloys, properties of advanced fuels, UN-W cermet, boiling liquid metals, protective coatings, corrosion, and space radiator. The FY-1964 progress and expected FY-1965 results are also summarized for each program. NSA

N76-27404# Hungarian Academy of Sciences, Budapest.
NMR METHOD FOR QUANTITATIVE ANALYSIS OF METALLIC ALLOYS
K. Tompa and K. Z. Balla 1975 13 p refs
(KFKI-75-67) Avail: ERDA Depository Libraries HC $4.25

The nuclear magnetic resonance (NMR) method is employed for quantitative analysis of metallic alloys, thereby enabling the nondestructive determination of the concentration of foreign atoms present in a dissolved state in the metal matrix. Valuable information can be obtained on the real structure of alloys by comparing dissolved impurity content obtained by NMR measurements and total impurity content determined chemically. The method is based on the measurement of the NMR intensity as a function of dissolved foreign atoms, the NMR signal intensity being measured through the derivative signal amplitude D with log D expressed as a linear function of the foreign atom concentration c. The slope of the curve depends on the quality of the foreign atom. Sample preparation, apparatus and procedure are given. Author (NSA)

N76-27405# Argonne National Lab., Ill.
X-RAY IMPACT INDUCED DESORPTION OF GASES FROM STAINLESS STEEL SURFACES
S. Brumbach and M. Kaminsky 1975 8 p refs Presented at 6th Symp. on Engr. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract W-31-109-eng-38)
(CONF-751125-71) Avail: NTIS HC $4.50

During the operation of plasma devices, the interaction of energetic photons with surfaces can cause gas release by photodesorption, and thereby contribute to plasma contamination. Measurements of gases released from stainless steel surfaces were made in an ultrahigh vacuum environment using X-rays characteristic for a tungsten target bremsstrahlung spectrum for electron energies varying from 15 to 50 keV. The predominant gas species observed mass spectrometrically are CO2 (m/e equals 44), CO (m/e equals 28), and O2 (m/e equals 32). Mean quantum yields for the release of these species from stainless steel were determined. For example, for fresh stainless steel surfaces irradiated by X-rays produced by 50 keV electrons, a mean quantum yield for molecular CO2 release of .0003 molecules per photons in a bremsstrahlung spectrum at 50 keV electron energy was observed. Based on such a quantum yield an outgassing rate was determined. Author (NSA)

N76-27406# Sandia Labs., Livermore, Calif.
COMPARISON OF 9Ni-4Co-0-0.20C STEEL AND TITANIUM ALLOY PROPERTIES FOR WEIGHT-CRITICAL STRUCTURAL APPLICATIONS
D. B. Dawson Jan. 1976 52 p refs
(Contract AT(29-1)-789)
(SAND-75-8301) Avail: NTIS HC $4.50

Titanium alloys are attractive in weight-critical applications requiring high strength, due to their high strength-to-density ratios when compared with steel and aluminum alloys. The mechanical properties of titanium alloys such as Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-6Al-2Sn-4Zr-6Mo, and several beta alloys are discussed and compared with 9Ni-4Co-00.20C steel. Data is presented for strength, fracture toughness, fatigue properties, stress corrosion cracking behavior, and corrosion resistance. The trade-off in strength vs. toughness, SCC resistance, and weldability of titanium alloys is discussed. Recommendations of specific titanium alloy systems for various required strength levels are made on the basis of these factors. Author (NSA)

N76-27407# Aerojet Nuclear Co., Idaho Falls, Idaho.
STUDY OF THE KINETICS OF COPPER CEMENTATION BY METALLIC NICKEL
R. L. Miller and M. E. Wadsworth 1975 24 p refs Presented at the Proc. of the Can. Inst. of Mining and Metallurgy, Edmonton, Canada, 25 Aug. 1975 Sponsored by ERDA
(CONF-750866-1) Avail: NTIS HC $4.50

The kinetics of cementation of copper by nickel from acidified solution of copper sulfate were found to follow a pseudo first-order-rate, with respect to copper concentration, over the temperature range studied. An Arrhenius plot of the temperature/rate-constant data was nonlinear. From this nonlinearity, the inference was that the overall reaction was controlled by a different mechanism at higher temperatures than at lower temperatures. The temperature/rate-constant data were analyzed using a nonlinear curve-fitting computer program. These analyses yielded an activation energy of about 3,700 cal/mole in the high temperature range and about 19,500 cal/mole in the low temperature range. The high temperature activation energy results are consistent with those for reaction control by diffusion of copper ion through a solution boundary layer. The activation energy for the low temperature range is consistent with that for reaction control by a chemical process. Author (ERA)

N76-27408# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
MECHANICAL PROPERTIES AND MECHANICAL EQUATION OF STATE OF 1100 ALUMINUM ALLOY IN MONOTONIC LOADING
F. V. Ellis and C. Y. Li 1975 41 p refs Sponsored by ERDA
(COO-2172-5) Avail: NTIS HC $5.00

Load relaxation experiments are performed on 1100 aluminum alloys as a function of temperature. Based on the experimental results, the behavior of the mechanical equation of state for plastic deformation including the contribution of grain boundary sliding is established. Attempts are made to apply the approach of mechanical equation of state to predict the creep properties of this alloy. Author (ERA)

N76-27409# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
INTRINSIC THERMAL EXPANSION OF POINT DEFECTS IN ALUMINUM Ph.D. Thesis - Poitiers Univ.
M. Asty Nov. 1975 93 p refs In FRENCH
(CEA-R-4698) Avail: ERDA Depository Libraries HC $6.00

The differential length measurement between two specimens, one pure and the other containing point defects, leads to the intrinsic thermal coefficient of expansion beta/sub d/ of the defect, according to the relation: beta/sub d/ = 1 delta V/sub d/ (delta delta V/sub d//delta T)/sub p/, delta V/sub d/ being the formation volume of the defect. A description is given of a differential dilatometer using laser interferometry operating between 77 and 300 K, with a sensitivity of about 100 A on and the length difference between an alloy sample and a pure dummy. Concerning substitutional impurities in aluminum between -190 and -90 C, the beta/sub d/ is shown to have an absolute value much larger than the thermal expansion coefficient beta/sub o/ of the aluminium matrix: beta/sub d beta/sub o/ approximately

equal to +3 to +6 for the magnesium impurity, beta/sub d/beta/sub o/ approximately equal to -3 to -4 for the calcium impurity, and to be independent of the temperature.
Author (ERA)

N76-27410# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
GRAIN BOUNDARY SLIDING AND STRUCTURE Progress Report, 1 Dec. 1974 - 30 Nov. 1975
C. Y. Li 1 Sep. 1975 28 p refs
(Contract E(11-1)-2172)
(COO-2172-11) Avail: NTIS HC $5.00

Load relaxation experiments were performed in the region where the grain matrix plastic deformation is important on type 316 stainless steel and a zircaloy specimen. Anelastic deformation in pure aluminum was investigated. A dislocation glide-controlled anelastic component was identified which may be governed by the same laws as those for plastic deformation at low temperature and/or high plastic strain rate. Grain boundary sliding in type 316 stainless steel was investigated. Experimental data without the influence of thermal aging were successfully obtained. Load relaxation data on single crystal and polycrystal nickel specimens show that the constant hardness curves of these specimens belong to two different families. The growth of the grain boundary cavity under applied stress and irradiation was analyzed. It was found that the normal stress at the grain boundary which is the driving force for atomic transport controlled cavity growth can be relaxed by grain boundary sliding. Author (ERA)

N76-27411# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Sci.
HYDROGEN STRENGTHENING IN NIOBIUM AND NIOBIUM-BASE ALLOYS
A. A. Sagues, M. G. Ulitchny, and R. Gibala 1975 15 p refs Presented at the Conf. on Effects of Hydrogen on Behavior of Mater., Jackson, Wyoming, 7 Sep. 1975
(Contract AT(11-1)-1676)
(COO-1676-37; Conf-750925-7) Avail: NTIS HC $4.50

Solid-solution hardening, precipitate hardening, and alloy softening for Nb and Nb-base interstitial alloys are discussed. The effects of these strengthening mechanisms on strain rate sensitivity and ductility are also examined. It is shown that all three strengthening effects involve mainly interaction of dislocations with mobile hydrogen defects and are influenced or caused by residual interstitial solutes. ERA

N76-27412# Brown Univ., Providence, R.I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Technical Progress Report, Jul. 1974 - Jun. 1975
J. Gurland and J. R. Rice Jul. 1975 14 p refs
(Contract E(11-1)-3084)
(COO-3084-38; TPR-38) Avail: NTIS HC $4.50

Major studies were completed on (1) the microscale fracture conditions for the brittle and ductile fracture initiation modes at a macroscopic crack tip, (2) the formulation of dilational plasticity constitutive relations for void containing materials as applied to the inception of ductile rupture, (3) cavity growth during diffusive rupture processes as encountered in creep rupture at low stress but high temperature, and (4) particle and boundary strengthening mechanisms in carbon steels. In addition, work has continued on crack tip modeling by finite elements and mechanisms of ductile void growth near a crack tip. Author (ERA)

N76-27413# Krupp (Fried.) G.m.b.H., Essen (West Germany).
OPTIMIZATION OF SUPERCONDUCTING NbTi ALLOYS Final Report [OPTIMIERUNG SUPRALEITENDER NbTi-LEGIERUNGEN]
Juergen Willbrand, Renate Arndt, Rolf Ebeling, and Rudolf Mohs Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1975 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-35) Avail: NTIS HC $5.00; ZLDI, Munich DM 20,20

The major practical applications of superconductors require high critical current densities at high fields. For NbTi alloys these values may be increased by adding copper and by carrying out an optimized heat treatment during production of the wires. Suitable methods were elaborated for melting the alloys, forming the ingots, and wire drawing. For copper surrounded wires (single filament) of a three-component alloy containing 2 % Cu critical current densities could be achieved 50 % higher compared to binary NbTi alloys. This increasing of current-carrying capacity may be explained from the microstructure of these alloys (electron microscope investigations). Author (ESA)

N76-27414# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
THE INFLUENCE OF RINSING AND DRYING PROCEDURES ON THE SURFACE QUALITY OF CrO3-H2SO4 PICKLED ALCLAD 2024-T3 MATERIAL
A. Kwakernaak Nov. 1974 18 p
(FOK-R-1790) Avail: NTIS HC $3.50

Some small investigations were carried out to determine the influence of variation of rinsing time and temperature, as well as variation of rinsing temperature, on the surface quality of CrO3-H2SO4 pickling of 2024 - T3 Alclad material. The following surface properties were measured: electric potential, impedance, surface configurations, and peel strength. It was found that the effect of the rinsing time in 60 C water is a decrease of voltapotential and peel strength. Also, a variation of the rinsing temperature shows a decreasing voltapotential and peel strength with an increasing rinsing temperature. Author (ESA)

N76-27415# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
CORROSION RESISTANCE OF ALUMINIUM ALLOYS AS A FUNCTION OF PRETREATMENT AND PAINT SYSTEM
P. F. A. Bijlmer 15 Aug. 1974 55 p
(FOK-R-1806) Avail: NTIS HC $4.50

An investigation on the effects of parameters such as material, pretreatment, adhesive primer, paint primer, and paint system on the paint adhesion both before and after exposure to a water test, and on the corrosion intensity after exposure to a film form corrosion test as a function of the time of exposure was carried out to improve aircraft aluminum alloy protection against corrosion. ESA

N76-27416# National Aerospace Lab., Amsterdam (Netherlands). Div. Structures and Materials.
HIGH TEMPERATURE GAS TURBINE MATERIALS
R. J. H. Wanhill Jun. 1975 21 p refs
(RNLAF-RB-C13-KL-1975)
(NLR-TR-75098-U) Avail: NTIS HC $3.50

The requirements and problems of high temperature materials in gas turbines are reviewed, with specific reference to turbine disks, blades, vanes, and combustion cans. The mechanical and environmental property requirements of these components are discussed, followed by an overview of the types of materials used. The problems of creep and stress rupture, low cycle fatigue (including thermal fatigue), oxidation, and hot corrosion, are summarized. Author (ESA)

N76-27417# European Space Agency, Paris (France).
ABNORMAL CREEP OF TITANIUM DURING THE ALPHA/BETA ALLOTROPIC TRANSFORMATION
Catherine Chaix Apr. 1976 51 p refs Transl. into ENGLISH of 'Fluage Anormal du Titane pendant la Transformation Allotropique alpha/beta', ONERA, Paris Report ONERA-NT-1975-1, 1975
(ESA-TT-283; ONERA-NT-1975-1) Avail: NTIS HC $4.50

Anisothermal creep compression tests of titanium specimens of usual purity are described. It is shown that the material is subjected to an abnormal contraction during the alpha/beta phase change. The amplitude of the deformation is proportional to the applied stress and is independent of the temperature variation rate. Three types of interpretation are discussed: those of P. Costa and G. Cizeron, F.W. Clinard and O.D. Sherby, and G.W. Greenwood and R.H. Johnson. It is shown that the third interpretation can account quantitatively for the abnormal contraction. ESA

N76-27418# Pennsylvania Univ., Philadelphia. School of Metallurgy and Materials Science.

STUDY OF BOND STRENGTHS IN METALS USING LOCALIZED FUNCTIONS Final Report
Louis A. Girifalco Jan. 1976 8 p refs
(Grant AF-AFOSR-2325-72; AF Proj. 9761)
(AD-A021150; AFOSR-76-0117TR) Avail: NTIS CSCL 20/12

The possibility of using Wannier functions in the theory of the energy of metals is important because it would greatly simplify the analysis of local interactions involved in defect formation, diffusion, ordering and precipitation. The objective of this study was to determine to what extent such localized functions could be applied to metals. This study began with the development of a general formalism that showed how to construct quasi-Wannier localized functions for nonperiodic as well as crystalline systems, and to incorporate such functions in cohesive energy theory. The theory was applied to the alkali metals, alkaline earth metals and cadmium, to successfully describe the cohesive energy, lattice parameter, compressibility and equation of state. The conclusion was that the method is practical, and localized functions can indeed be used in metals. A model was proposed, the 'rigid Wannier function' model, which would greatly simplify calculations in distorted crystals. The model gives a reasonable representation of the electron density around point defects in ideal methods. It is currently being applied to phonon spectra and relaxation of atoms around an impurity. This work will continue even though the contract period is over. Author (GRA)

N76-27419# Washington State Univ., Pullman. Dept. of Physics.
FAILURE PROPERTIES OF ALUMINUM AND ALUMINUM ALLOYS UNDER IMPACT CONDITIONS Final Report
George E. Duvall and G. Richard Fowles 1976 22 p refs
(Grant AF-AFOSR-2037-71; AF Proj. 9764; AF Proj. 6813)
(AD-A021129; AFOSR-76-0044TR) Avail: NTIS CSCL 20/12

Research under this grant was directed to two distinct tasks. First was study of the kinetics of shock-induced phase transitions in solids; second was measurement of precursor amplitudes in aluminum under carefully controlled conditions. Shock-induced stresses were measured in single crystals of KCl with shock waves propagating in <100>, <110>, and <111> directions and in single crystals of BaF2 with propagation in <111> and <100> directions. KCl measurements give clear evidence of the initiation of transformation at the established (fcc-bcc) transformation pressure. Stress-time profiles in BaF2 with <111> orientation have a complex structure which apparently results from interaction between the shear yielding process and phase transformation. Precursor amplitudes in aluminum are uniformly low for 1060-0 commercial aluminum, 5-9's single crystals, and single crystals doped with .01 and 0.1 atomic percent copper. Variation of heat treatment to change precipitate structure affects precursor amplitude as it does static yield stress. GRA

N76-27420# Connecticut Univ., Storrs. Dept. of Physics.
PHONON SCATTERING AND THERMAL CONDUCTIVITY OF PLASTICALLY DEFORMED ALLOYS Final Report
Paul G. Klemens and Dwight H. Damon Dec. 1975 15 p refs
(Grant AF-AFOSR-2418-73; AF Proj. 9761)
(AD-A020732; AFOSR-TR-76-0058) Avail: NTIS CSCL 20/13

The lattice component of the thermal conductivity of annealed and cold-worked aluminum-magnesium alloys was determined from 1 to 60K. The principal phonon scattering mechanisms identified were scattering by electrons, by solute atoms, by dislocations and by dislocation loops. The lattice thermal conductivity of copper-nickel alloys was also studied, and measurements of some copper alloys were extended down to 0.5K. The lattice thermal conductivity of two copper-aluminum alloys were studied during cyclic fatigue; the results revealed random dislocations and dislocation arrays. Theoretical studies included scattering of Rayleigh waves by surface irregularities, scattering of phonons by platelets in diamond, thermal resistivity of complex dielectric crystals at high temperatures, formation of solute atmospheres around dislocations and scattering of phonons in ordered alloys. Author (GRA)

N76-27421# Missouri Univ., Columbia. College of Engineering.
THE EFFECT OF MICROSTRUCTURE ON THE FATIGUE PROPERTIES OF A .40/150 CARBON STEEL M.S. Thesis
Jerry Alan Wear and David W. Hoeppner Dec. 1975 189 p refs
(Contract N00014-75-C-0670)
(AD-A019755; TR-3) Avail: NTIS CSCL 11/6

One of the primary methods used today in changing the properties of materials is heat treating (changing the microstructure). However, little work has been done to determine the effect of microstructure on the fatigue properties of a material. Work performed on four microstructures of a .40/.50 carbon steel is reported. The fatigue properties of the four microstructures were compared in a traditional manner (S-N data) and by measuring crack propagation in center cracked panels (2a-N data). An effect of microstructure on fatigue was observed as a 'stacking and sorting' of both the S-N and 2a-N data. GRA

N76-27422# Missouri Univ., Columbia. College of Engineering.
THE EFFECT OF MICROSTRUCTURE ON THE FATIGUE LIFE OF TITANIUM M.S. Thesis
Dale A. Wilson and David W. Hoeppner Dec. 1975 120 p refs
(Contract N00014-75-C-0670)
(AD-A019756; TR-4) Avail: NTIS CSCL 11/6

An empirical approach to fatigue design has not prevented structural fatigue failures. One area that needs greater emphasis is the interface of microstructure with its application. Therefore, in this study commercially pure titanium has been heat treated to establish various microstructures. Unnotched fatigue specimens were used for traditional S-N tests and center crack panels were used for crack growth tests. The test results then were examined in order to determine the effect microstructure has on the fatigue life of titanium. This effect was more prevalent in the near-threshold crack growth region. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N76-27423*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ATMOSPHERE AND TEMPERATURE ON WEAR, FRICTION, AND TRANSFER OF POLYIMIDE FILMS
Robert L. Fusaro 1976 28 p refs Proposed for presentation at the Lubrication Conf., Boston, 5-7 Oct. 1976; sponsored by the Am. Soc. of Lubrication Engr. and the Am. Soc. of Mech. Engr.
(NASA-TM-X-73423; E-8761) Avail: NTIS HC $4.00 CSCL 11D

Friction and wear experiments conducted on polyimide films bonded to 440C stainless steel disks indicated that a wear transition (from high wear to low wear) accompanied the friction transition (from high friction to low friction). The transition was found to be atmosphere dependent as well as temperature dependent. Wear rate calculations indicated that at temperatures above the transition, wear could be up to 600 times less than at temperatures below the transition. Transfer to metallic riders was also investigated and found to be considerably different at temperatures above and below the transition. Author

N76-27424*# Horizons, Inc., Cleveland, Ohio.
OPEN CELL FIRE-RESISTANT FOAM Final Report, 1 Jul. 1975 - 16 Feb. 1976
James E. Thompson, Joseph W. Wittman, and Kennard A. Reynard Apr. 1976 43 p refs
(Contract NAS9-14717)
(NASA-CR-147791) Avail: NTIS HC $4.00 CSCL 11G

Candidate polyphosphazene polymers were investigated to develop a fire-resistant, thermally stable and flexible open cell foam. The copolymers were prepared in several mole ratios of the substituent side chains and a (nominal) 40:60 derivative was selected for formulation studies. Synthesis of the polymers involved solution by polymerization of hexachlorophosphazene to soluble high molecular weight poly(dichlorophosphazene), followed

by derivatization of the resultant polymer in a normal fashion to give polymers in high yield and high molecular weight. Small amounts of a cure site were incorporated into the polymer for vulcanization purposes. The poly(aryloxyphosphazenes) exhibited good thermal stability and the first polymer mentioned above exhibited the best thermal behavior of all the candidate polymers studied. Author

N76-27425*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
EFFECT OF POLYMER PROPERTIES AND ADHEREND SURFACES ON ADHESION Semiannual Report
David W. Dwight and James P. Wightman Jul. 1976 20 p refs
(Grant NsG-1124)
(NASA-CR-148312) Avail: NTIS HC $3.50 CSCL 11G

High temperature polymer surface characteristics associated with joint strength were evaluated. Selected samples represented composite adherends, aluminum filler and fiber glass carrier cloth. Detailed analysis of fractured joint surfaces revealed unique characteristics typical of the specific adhesive formulations and test conditions. A fracture mechanism model was developed for correlating macroscopic shear strength and microstructure of fracture surfaces. Applications were made to unpublished data on polyimides and fluoropolymers. B.B.

N76-27426*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ANALYSIS OF PMR-POLYIMIDES BY DIELECTROMETRY
Richard E. Gluyas 1976 27 p refs Presented at A Critical Rev. of Techniques for the Characterization of Polymeric Mater. held by the Tech. Cooperation Program, Subgroup P, Tech. Panel 3 (Organic Mater.) (TTCP-P-3), Watertown, Mass., 6-8 Jul. 1976
(NASA-TM-X-73448; E-8807) Avail: NTIS HC $4.00 CSCL 11G

A preliminary study was conducted to determine the dielectric properties of glass fabric reinforced composites as influenced by the reactions occurring during the preparation of crosslinked polyimides by the PMR process. The variables studied included: formulated molecular weight, staging temperature and time; rate of temperature increase to cure temperature; and cure temperature and time. The changes of capacitance and, particularly, of dissipation factor were found to be strongly dependent on each of the variables studied. Author

N76-27427# Electrotechnical Lab., Tokyo (Japan).
MULTIPLE DIFFUSION PROCESS IN OXIDE GLASSES
Hiroshi Namikawa Dec. 1975 88 p refs
(Rept-757) Avail: NTIS HC $5.00

Experimental results of the electric conduction and the dielectric relaxation in many ionically and electronically conducting glasses are examined to elucidate the peculiarity of the diffusion process in oxide glasses. A new concept on the diffusion process and the structure of oxide glasses is established. Author

N76-27428# Bendix Corp., Kansas City, Mo.
EVALUATION OF TPX MOLDING RESIN
C. L. Walter Oct. 1975 15 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1301-Rev) Avail: NTIS HC $4.00

A methylpentene polymer (TPX) was evaluated for possible low density applications. Rheological properties were evaluated and physical characteristics were determined. Thermal analyses data were used to determine that the softening point was 93.5 C and that decomposition begins at 290 C. Nine experimental lines (different sets of conditions) were molded to statistically evaluate the combinations of molding variables. Two variables, melt temperature and mold temperature, each had five levels of variance. All other molding conditions were held constant. The TPX can be molded successfully under a wide range of conditions. Its major features include high transparency and low specific gravity (0.83 to 0.85). Its physical strengths are like those of high-density polyethylene except that it will shatter upon impact. The heat distortion temperature of TPX is about 130 C, which is far greater than that of polyethylene and about 20 C higher than that of polypropylene. Author (ERA)

N76-27429# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
CHEMICAL RESISTANCE OF POLYETHYLENE (PER MAT. SPEC. 5.585) AGAINST GREASE-8 AT R.T. AND 60 C
L. M. Godfried 27 Feb. 1974 9 p
(FOK-R-1763) Avail: NTIS HC $3.50

The chemical resistance of polyethylene against Grease-8 after long term immersion at room temperature and 60 C was determined measuring the change in thickness, weight, and Shore D hardness of 12 polyethylene specimens. It was found that polyethylene is resistant to Grease-8 at room temperature. The effect of immersion at 60 C is greater than the chemical effect of the Grease-8 at the same temperature. At 60 C some absorption takes place since an increase in weight (11 %) and thickness (4.5 %) was found. ESA

N76-27430# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
DETERMINATION OF THE ADHESIVE BONDING ABILITY OF VESPEL MATERIAL AND MID VELCRO TAPE TO METAL HONEYCOMB PANELS WITH EC 2216 B/A
J. Koetsier 13 Jun. 1974 5 p
(FOK-R-1786) Avail: NTIS HC $3.50

The bonding ability of Vespel material to metal sandwich parts, as well as the adhesion of Mid temp Velcro tape, was determined using EC 2216 B/A, a cold curing modified epoxy, as adhesive. It was found that the bonding strength of Vespel parts and Mid temp Velcro tape to metal honeycomb with EC 2216 B/A is satisfactory, while the mutual adhesion of Mid temp Velcro tape, although low, is acceptable for fixing a number of detachable standoffs to metal honeycomb panels. ESA

N76-27431# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
LONG-TERM ARTIFICIAL AGEING TESTS ON STRUCTURAL ADHESIVE REDUX 775 LIQUID POWDER
J. Koetsier 16 Dec. 1975 24 p
(FOK-R-1796) Avail: NTIS HC $3.50

Results are given of artificial aging tests on adhesive REDUX 775 liquid and powder to investigate the durability of the bonded joints under various environmental conditions. Overlap shear test specimens, sawn from exposure test panels, were tested at room temperature after 200, 500, 750, and 1,000 hrs aging at 70 C, 95 - 100 % relative humidity, 30 days aging at 50 C, 95 - 100% relative humidity, 200, 500, 1,000, and 3,000 hrs immersion in boiling tap water (95 - 100 C). Test results show that the durability of REDUX 775 liquid and powder bonded joints is slightly/not affected by the long-term exposure to the hot-wet environmental test conditions (the 4,500 hrs exposure excluded). Author (ESA)

N76-27432# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MULTILAYER SUPERINSULATION FOR THERMAL INSULATION Final Report [WAERMEISOLIERUNG DURCH SUPERISOLATION]
Helmut Langer and Wolfgang Rust Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1975 143 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-42) Avail: NTIS HC $6.00; ZLDI, Munich DM 30,05

Different methods of manufacturing and mechanical treatment of multilayer superinsulation systems for the range of cryogenic temperatures up to about 800 C are described in addition to a selection of suitable foil - and spacer materials. The characteristics of these methods were tested with regard to the material properties of the used foils and spacers, the design of assembly- and mounting components, and a high reproducibility of the insulation systems. The test facilities used and measuring methods are described. Results are discussed. Author (ESA)

N76-27433# Centre National d'Etudes Spatiales, Toulouse (France).
METHOD FOR MEASURING THE SOLAR ABSORPTION FACTOR [METHODE DE MESURE DU FACTEUR D'ABSORPTION SOLAIRE]
Jacques Simon Mar. 1976 18 p refs In FRENCH; ENGLISH

summary
(CNES-NT-34) Avail: NTIS HC $3.50

A method for measuring the thermal control coatings solar absorptance is discussed. Solar absorptance is determined at room temperature by near normal absolute spectral reflectance measurements over the wavelength region of 0.2 to 2.7 m. The resulting spectral data is then integrated against the Thekaekara curve to obtain solar reflectance from which the solar absorptance is inferred. Author (ESA)

N76-27434# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
QUASI-STATIC SOLID PARTICLE DAMAGE IN BRITTLE MATERIALS Interim Report, Mar. 1975 - Jan. 1976
A. G. Evans, T. R. Wilshaw, J. C. Chesnutt, and H. Nadler 14 Feb. 1976 125 p refs
(Contract N00014-75-C-0669)
(AD-A020736; SC5023.3TR; IR-1) Avail: NTIS CSCL 11/2

This report is a three part study of indentation fracture in the plastic contact regime. The first part summarizes the observations of fracture and develops a fracture classification scheme. The second part discusses the implications of the fracture characterization for fracture toughness determinations, and abrasive wear and low velocity erosion prediction. Finally, the third part discusses indentation friction and its measurements, as needed to determine the role of friction in the indentation fracture process. Author (GRA)

N76-27435# Rensselaer Polytechnic Inst., Troy, N.Y. Div. of Materials Engineering.
TRANSITION METAL IONS AND HETEROGENEOUS NUCLEATION IN GLASS. TECHNICAL REPORT NO. 3: MAGNETIC AND MORPHOLOGICAL STUDY OF Fe_2O_3 CATALYSED CRYSTALLISATION IN A CaO-MgO-Al_2O_3-SiO_2 GLASS Annual Report
Deug W. Moon, Joseph C. Williams, and Robert K. MacCrone Jan. 1975 41 p refs
(Contract N00014-67-A-0117-0017; NR Proj. 032-518)
(AD-A021069; RPI-JBD35-3) Avail: NTIS CSCL 11/2

A CaO-MgO-Al_2O_3-SiO_2 glass containing the nucleating catalyst Fe_2O_3 was subject to a series of nucleating heat treatments. Magnetic susceptibility measurements from room temperature to 50mK have been made on these samples, and the paramagnetic resonance down to 4K determined. The morphology of the specimens was concomitantly investigated using SAXS (Small angle X ray scattering), optical microscopy and electron microscopy. All the magnetic measurements above 2K failed to reveal any changes upon nucleation heat treatments. Magnetic susceptibility measurements below 2K showed systematic variations in the magnetic behaviour with nucleation. The structural variations responsible were not determined. In conclusion, this study indicates that the mechanism of catalysed crystallisation in this glass is very subtle. GRA

N76-27436# Army Natick Development Center, Mass. Clothing Equipment and Materials Engineering Lab.
NOVEL POROUS SHEET MATERIALS OF POTENTIAL SUITABILITY FOR MILITARY TEXTILE APPLICATIONS
Gilbert N. Arons Aug. 1975 45 p refs
(DA Proj. 1T7-62723-AH-98)
(AD-A020841; CE/MEL-147; NDC-TR-76-8-CE/MEL) Avail: NTIS CSCL 11/5

Novel approaches to formation of porous sheets were considered as offering potential replacement, alternative or substitute materials for conventional textile applications. Some materials, processes and potential applications are suggested for further investigation. Fibers, continuous and interrupted film, and foam were found to be the elementary structures which offer suitable performance features in general and govern the particular characteristics. Fibrous web systems continue to appear as the most favorable and versatile. The most economical routes to the formation of nonwoven fibrous webs are integral with the initial extrusion of thermoplastic polymers, as in the spunbonded, sprayspun, meltblown, fibrillated film and fibrillated foam processes. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N76-27437# Institut Franco-Allemand de Recherches, St. Louis (France).
COMPARISON BETWEEN EROSION EFFECTS DETERMINED BY MEANS OF TEST CHAMBER AND DURING FIRING [VERGLEICH ZWISCHEN EROSIONSVERSUCH UND EROSIONSBESCHUSS]
D. Grune 2 Aug. 1974 16 p refs In GERMAN Presented at the 51st BAkWVT Working Group Meeting 'Wehrtechnik', Mannheim, West Ger., 9 May 1974
(ISL-CO-8/74) Avail: NTIS HC $3.50

Two techniques for determining the erosion caused by weapon propellants were compared: the classic Vieille erosion tests improved by ISL, where the explosive is ignited in an erosion chamber, and a test developed by the Armament Service in Thun, Switzerland, where the explosive is ignited in a 7.5 cm caliber weapon. It is concluded that the experimental or theoretical erosion deg (Eg) values of the different explosives are a direct measure for the erosion to be expected in the weapon. Various means to reduce the weapon erosion are indicated. ESA

N76-27438# Institut Franco-Allemand de Recherches, St. Louis (France).
ELECTRIC DETONATORS WITHOUT INITIATING EXPLOSIVE [ELEKTRISCHE DETONATOREN OHNE INITIALSPRENGSTOFF]
H. H. Licht and H. W. Koch 12 Dec. 1974 14 p refs In GERMAN Presented at the Carl-Cranz-Ges. Seminar 'Zuender', Weil am Rhein, West Ger., 22 Oct. 1974
(ISL-CO-35/74) Avail: NTIS HC $3.50

Advantages and disadvantages of electric detonators are discussed briefly. The requirements for such detonators are indicated, and some examples are given. Power requirement and ignition circuit are discussed, and the influence of the explosives used on the detonator design is investigated. ESA

N76-27439# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
RELIABILITY ANALYSIS OF SOLID ROCKET PROPELLANTS AND ENGINES. PART 10: DETERMINATION OF THE HARDNESS OF HOMOGENEOUS SOLID ROCKET PROPELLANTS [BETROUWBAARHEIDSONDERZOEK VAN RAKETKRUIT EN RAKETMOTOREN. TIENDE DEELVERSLAG. DE BEPALING VAN DE HARDHEID VAN HOMOGEEN RAKETKRUIT]
J. A. VanDerSchroeff 15 Sep. 1975 24 p refs In DUTCH; ENGLISH summary
(Contract A64/KL/097)
(TL-1975-11; TDCK-66830) Avail: NTIS HC $3.50

The Shore D hardness of four double-base rocket propellants has been measured with a Zwick Durometer as a function of the time of loading (5 to 15 s), the relative humidity (20 to 80 % relative humidity) and the temperature (-40 to 60 C). From these results and a literature survey it is concluded that hardness measurements efficiently produce values for comparison, but are less suitable to calculate material constants.
Author (ESA)

N76-27440# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
RELIABILITY ANALYSIS OF SOLID ROCKET PROPELLANTS AND ENGINES. PART 11: DETERMINATION OF MECHANICAL PROPERTIES OF HOMOGENEOUS SOLID ROCKET PROPELLANTS FOR FAST DEFORMATION [BETROUWBAARHEIDSONDERZOEK VAN RAKETKRUIT EN RAKETMOTOREN. ELFDE DEELVERSLAG. BEPALING VAN MECHANISCHE EIGENSCHAPPEN VAN HOMOGEEN RAKETKRUIT BIJ SNELLE DEFORMATIE]
P. J. Greidanus 30 Sep. 1975 73 p refs In DUTCH; ENGLISH summary

(Contract A64/KL/097)
(TL-1975-18; TDCK-66958) Avail: NTIS HC $4.50

Rocket launching conditions with relation to loading of solid rocket propellants are simulated by using a modified Rotter apparatus and a Zwick impact testing device. Samples of N-4 propellant have been loaded in compression or tension tests to evaluate the testing apparatus and to determine stress-strain relationships. The impact experiments of N-4 propellant at 20 C confirm that no mechanical failure of this solid propellant will occur during the fast pressure-rise after ignition. Author (ESA)

N76-27441# Exxon Research and Engineering Co., Linden, N.J. Government Research Lab.
DEVELOPMENT OF HIGH STABILITY FUEL Final Report, 1 Apr. - 30 Nov. 1975
William F. Taylor and John W. Frankenfeld Dec. 1975 147 p refs
(Contract N00140-74-C-0618)
(AD-A020383; EXXON/GRU.15GAHF.75) Avail: NTIS CSCL 21/4

The program to develop High Stability JP-5 is framed in the context of an extended effort involving bench scale studies of the fuel modifications necessary to improve the thermal stability of JP-5 type fuels so that fuel production specifications and storage and handling techniques can be established. Fuel modifications to be experimentally investigated include removal and exclusion of molecular oxygen (O2), control of trace levels of organic sulfur, nitrogen and oxygen compounds, control of olefin compound type and level, reduction of dissolved metals, control of metal surface type contacting the fuel, and the use of additives. This report deals with the continuation of this program. GRA

N76-27442# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
ANALYSIS OF CHITIN IN CONTAMINATED FUELS Final Report, Dec. 1973 - Jul. 1975
Gertrud Ernst, Dario A. Emeric, and Sidney Levine Sep. 1975 19 p refs
(AD-A020298; USAMERDC-2158) Avail: NTIS CSCL 21/4

A test method is described for indicating an early stage of biodegradation (fouling) of hydrocarbon fuels by fungi and for chemically differentiating a massive fungus contamination from a nonbiological one. The test results may be used to differentiate between corrosion caused by fungi and from other origins. The test method is based on the chemical analysis of chitin, a polymer of N acetylglucosamine, which is a cell wall constituent of most fungi. Author (GRA)

N76-27443# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CLASSIFICATION OF IMPURITIES
Jan Krotky 16 Jan. 1976 16 p Transl. into ENGLISH from Zpravodaj Vzlu (Czechoslovakia), no. 4, 1973 p 33-38
(AD-A020284; FTD-ID(RS)I-2286-75) Avail: NTIS CSCL 21/4

The purpose of this article was to present general information about the problems of aircraft fuel purity, particularly aircraft paraffins. Fuel purity requirements, and filtering technology, and the construction of fuel systems are discussed. The increasing consumption of aircraft fuel, increased quantities of fuel pumped in filling maneuvers, increasing requirements of safety and the prolonged operating periods of aircraft lead to higher requirements for fuel purity. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N76-27444*# Ball Bros. Research Corp., Boulder, Colo. Aerospace Div.
DEWAR TECHNOLOGY STUDY Final Report
W. Davis Oct. 1975 122 p refs
(Contract NAS8-29848)
(NASA-CR-149921; F75-20) Avail: NTIS HC $5.50 CSCL 20L

The development of a Dewar system for handling liquid helium under weightless conditions is described. Porous plug designs for the prevention of superfluid creep out of the dewar through the vent line were evaluated. For the purpose of designing a neck to provide a transition from the cold cavity to the outside, the loads carried by the neck and equipment supports were studied. Temperature, pressure, and mass flow instrumentation for monitoring Dewar performance were also evaluated. In addition, multilayer blankets consisting of aluminized Mylar separated by Dacron net sheets were designed to insulate the pressure vessel. The dewar system is suggested for use with the star tracking telescope aboard the relativity satellite. D.M.L.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N76-27445 British Broadcasting Corp., Kingswood (England). Research Dept.
AN EXPERIMENTAL COMPARISON OF FOUR METHODS FOR 64 kbit/s CODING OF SPEECH WITH A 7 kHz BANDWIDTH
D. W. Stebbings May 1976 9 p refs
(BBC-RD-1976/11) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Four possible methods are investigated for coding speech signals with a 7 kHz bandwidth to give commentary-circuit programme-quality, within a digital telephony bit-rate of 64 kbit/s. They all exploit redundancy in speech signals, and produce different subjective effects. Apparatus was constructed, either implementing or closely simulating each method, and tests were made with a wide variety of speech and music in order to assess the relative merits of each method. It was concluded that two of the methods give marked improvements over techniques previously studied. The two preferred methods respectively used pitch-halving and variable sampling-rate bit-rate reduction techniques; they both gave speech quality which may be acceptable for commentary circuits. None of the methods would be acceptable for musical items. Author

N76-27446 British Broadcasting Corp., Kingswood (England). Research Dept.
AUDIO NON-LINEARITY: A COMB-FILTER METHOD FOR MEASURING DISTORTION
R. A. Belcher May 1976 14 p refs
(BBC-RD-1976/12) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A new method of measuring nonlinear distortion of sound signals is described. This method uses a test-noise signal, based on a pseudo-random sequence and occupying most of the audio band, in conjunction with comb-filter techniques to measure distortion over a wide frequency range; it gives better correlation with subjective test results than the conventional total harmonic distortion method. Author

N76-27447 British Broadcasting Corp., Kingswood (England). Research Dept.
CEEFAX: INITIAL FIELD TRIAL AT UHF OF UNIFIED STANDARD
M. G. Croll May 1976 8 p refs
(BBC-RD-1976/9) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A short series of field trials was conducted in late 1974 to assess the effects of some changes in the specification of the transmitted CEEFAX data waveform brought about by adopting the unified standard parameters. The results of 24 site tests indicate that these changes reduced the minimum field strength required for a marginal CEEFAX service by about 3.5 db. The field strength for half the characters on a CEEFAX page to be received correctly the first time a page was requested was found

to be some 12.5 db lower than the minimum required for an acceptable color television service. Author

N76-27448 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL VIDEO: A THEORETICAL ASSESSMENT OF THE QUANTISING NOISE SPECTRA ARISING FROM A CHANGE IN THE SAMPLING FREQUENCY OF PAL SIGNALS
T. A. Moore May 1976 11 p refs
(BBC-RD-1976/10) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

When a digital video signal undergoes a change of sampling frequency, the quantizing noise of the original signal is modified by the resampling process, and extra quantizing noise is added when the resultant samples are truncated to the required output accuracy. The resulting quantizing noise spectrum depends on the complete digital history of the signal and is determined by such factors as the original and final quantizing accuracies, the interpolation profile and, in the case of sub-Nyquist sampling, the form of the comb-filter response. The resulting quantizing noise spectra are derived for various combinations of sampling frequencies, super- and sub-Nyquist. The change in the signal-to-noise ratio is evaluated for PAL System 1 parameter values. Particular cases of interest are examined, for example when equal quantizing accuracies are used for the input and output signals and when the input and output frequencies are combinations of four times, three times, and twice color subcarrier frequency. Author

N76-27449*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
MICROWAVE REMOTE ENVIRONMENT SOUNDING
K. Ya. Kondratyev, Yu. I. Rabinovich, Yu. M. Timofeyev, and Ye. M. Shulgina Jul. 1976 126 p refs Transl. into ENGLISH of the book "Mikrovolnovoye distantsionnoye zondirovaniye okruzhayuschey sredy" Obninsk, Informational Center, 1975 p 1-111
(Contract NASw-2789)
(NASA-TT-F-16930) Avail: NTIS HC $6.00 CSCL 20N

Microwave remote sounding has two principally important advantages: (1) a multipurpose nature in the sense that the measurement data of outgoing microwave radiation can be used for remote indication of the parameters of the atmosphere, the underlying surface, and the upper soil layer, and (2) all-weather applications which make it possible, for example, to perform thermal sounding in the atmosphere, regardless of cloud conditions. Specific capabilities of microwave remote sounding are considered, beginning with an examination of the physical basis of the method. Author

N76-27450# Communications Research Centre, Ottawa (Ontario).
REVIEW OF PROPAGATION IN THE 470-890 MHz BAND WITH EMPHASIS ON LAND MOBILE AND CELLULAR SYSTEMS
F. H. Palmer Feb. 1976 32 p refs
(CRC-1288) Avail: NTIS HC $4.00

The result of a review of the literature on the subject of VHF-UHF radiowave propagation in urban environments is presented. Path loss and its variance, multipath effects including delay and Doppler spreads, and building penetration are discussed. Available results are related to the problems of vehicle position monitoring and coverage pattern requirement encountered in cellular communication systems. Author

N76-27451# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THE EFFECT OF BLURRING ON AIRCRAFT CLASSIFICATION BY THE MOMENT METHOD
J. Mendelsohn, G. Gardner, and M. Wohlers Jun. 1976 31 p refs
(RM-620) Avail: NTIS HC $4.00

The Television Sighting Unit (TVSU) is a system for the tracking of threats by combat aircraft which combines search radar with a telescope mounted on the aircraft. The radar acquires the target and locks the telescope onto it. At that point the target can be tracked optically. The image acquired via the telescope is then displayed on a TV screen for identification. An optical device capable of acquiring images at very long ranges (75-100 miles) can be visualized. An on-board microprocessor would perform various image enhancement and classification algorithms on the images and ultimately provide a judgement as to the nature of the threat. The computer itself could even decide and execute the appropriate action to be taken. The ability to classify identify optical images of airplanes by computer is crucial to the above scenario. An approach to the problem, the moment method, is being investigated. Author

N76-27452# Naval Postgraduate School, Monterey, Calif.
ELECTRICAL CHARACTERISTICS OF MONOPOLE ANTENNAS ABOVE A RECTANGULAR PRISM Final Report, 1 Feb. - 1 Dec. 1975
Charles Thomas Ristorcelli and Richard William Adler Dec. 1975 124 p refs
(AD-A021857; NPS-52Ab75121) Avail: NTIS CSCL 17/2

A scaled model of an idealized superstructure was used to support an electrically thin radiating monopole antenna. The surface charge and current distributions on the antenna were measured, and with the resulting data, the antenna's apparent admittance was calculated. The procedures for measurements of surface distributions on antennas were then modified to permit similar measurements on flat metallic surfaces, and with the modified techniques the surface charge and current distributions were obtained for vertical sides of the model superstructure. The results of the measurements provide benchmark data for use in connection with the application of numerical techniques for the analysis of geometrical configurations similar to the model used in the experiment. Author (GRA)

N76-27453# Institut Franco-Allemand de Recherches, St. Louis (France).
A NEW DOPPLER RADAR APPARATUS WITH SUPERHETERODYNE RECEIVER FOR EXTERIOR BALLISTIC MEASUREMENTS [EIN NEUES DOPPLER-RADARGERAET MIT UEBERLAGERUNGSEMPFAENGER FUER AUSSENBALLISTISCHE MESSUNGEN]
M. Koenig, B. Koch, G. Simon, and J. P. Mangold 23 Aug. 1974 60 p refs In GERMAN
(ISL-32/74) Avail: NTIS HC $4.50

The technical setup and essential characteristics of a bistatic CW Doppler radar apparatus for velocity measurement of small and middle caliber projectiles near the ground are described. The 5 W apparatus operates at 9,365 MHz. In order to suppress ground reflections and to reduce the receiving signal dynamics, special cylindrical parabolic antennas with strong vertical focusing (2 deg) and horizontal squared sec characteristics were used. By applying an intermediate frequency of 60 MHz the signal-to-noise ratio of the receiver was improved. The data evaluation and computation system is described, and the performance of the equipment is demonstrated with some typical measurement results on small caliber arrow projectiles (radar cross section 2.8 sq cm) with nearly plane trajectories 1 to 1.5 m above the ground. ESA

N76-27454# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany)
STOCHASTIC APPROXIMATION IN ADAPTIVE SUPPRESSION OF EXTERNAL NOISE SOURCES FOR ANTENNA ARRAYS [ZUR ANWENDUNG DER STOCHASTISCHEN APPROXIMATION BEI DER ADAPTIVEN UNTERDRUECKUNG VON STOERERN BEI GRUPPENANTENNEN]
W. D. Wirth Sep. 1974 50 p refs In GERMAN; ENGLISH summary
(Rept-224) Avail: NTIS HC $4.00

The application of stochastic approximation for adaptive suppression of external noise sources, e.g. jammers, is investigated for high ratios of external to internal noise power. Without normalization with respect to the residual noise, stable filter weights are obtained. After a change of the noise sources the adaptation should be judged not only with respect to the residual noise power but also to the removal of the dips in the antenna pattern corresponding to the old noise directions. Normalization of the filter after a total change of the noise sources is emphasized instead of adaptation to the last filter weights. Author (ESA)

N76-27455# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
A STUDY OF ULF WAVES BETWEEN CONJUGATE POINTS
F. Langeaud and J. L. Lacoume 30 Sep. 1975 62 p refs
(CEPHAG-27/75) Avail: NTIS HC $4.50

The occurrence and the amplitude spectral density of the micropulsation Pc 1 were investigated. The ULF waves were recorded at two pairs of conjugate points situated at the same meridian level at a distance of 500 km. The respective influences of the ionosphere, the conditions of the Pc 1 emission on the number of the observed cases, and their amplitude distribution function were determined. A comparative study between the different levels and forms of the amplitude spectral densities clarifies the absorption amount orders of the ionosphere and the propagation effect in the magnetosphere. ESA

N76-27456# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
PRELIMINARY RESULTS ON THE THEORY AND PRACTICE OF THE MEASUREMENT OF ULF WAVES IN THE TIME-FREQUENCY DOMAIN
F. Langeaud, J. L. Lacoume, and W. Kofman 1 Dec. 1975 14 p refs
(CEPHAG-38/75) Avail: NTIS HC $3.50

Experimental results on practical methods of estimation of the slope and time of arrival of FM (Pc 1) type signals are presented. The sensitivity of measurements to phase coherency is emphasized showing the usefulness of generalized coherency for these measurements. ESA

N76-27457# AEG-Telefunken, Backnang (West Germany).
ASPECTS OF DIRECT SATELLITE TELEVISION BROADCASTING
Diederich Koehn 1975 5 p refs Presented at the World Telecommun. Forum Tech. Symp., Geneva, 1975
Avail: NTIS HC $3.50

The concept of a high-power satellite for direct television broadcasting is described. The capacity of the satellite for carrying different payloads is discussed. Today, television programs are distributed mainly by chains of terrestrial transmitters; however, for some years the use of broadcast satellites for direct TV reception has been under discussion since the availability of increased primary electrical power in satellites now makes the concept of a television broadcast satellite system feasible. Such a system would consist of both the space segment (the satellite) and the ground segment (mainly the home receivers). The economy of the system depends on the proper choice of the parameters of both segments which are interrelated by the down link budget. Author (ESA)

N76-27458# Radiotechniques S. A., Suresnes (France).
TECHNICAL-ECONOMIC STUDY OF THE CONVERTER OF PRIVATE OR COMMUNITY RECEIVERS OF SATELLITE BROADCASTING SYSTEMS IN THE 12GHz RANGE [ETUDE TECHNICO-ECONOMIQUE DU CONVERTISSEUR D'UN RECEPTEUR DU TYPE DOMESTIQUE OU COMMUNAUTAIRE DESTINE A LA RECEPTION DES PROGRAMMES DE RADIODIFFUSION PAR SATELLITE DANS LA BANDE DES 12 GHz]
G. Faynot and M. Mauffret [1975] 113 p refs In FRENCH
(Contract ESRO-SC/58-HQ)
(ESA-CR(P)-812) Avail: NTIS HC $5.50

A search for optimization between ground segment and space segment in a satellite broadcasting reception system was performed. Performances of converters at the 1980 horizon were evaluated together with costs on a mass production basis. The broadcast emission characteristics are reviewed and the various reception systems are discussed with regard to intermediate frequencies and noise factors with or without preamplifier. The state of the art for preamplifiers, mixers, intermediate frequency amplifiers, local oscillators, and overall converters at 12 GHz is depicted. Probable performances in 1980 are given considering subsystems with one or two frequency shifts. A range of configurations is proposed and the signal processing is detailed with regard to sound track modulating a subcarrier vs separate carrier. Costs are investigated for microwave circuits and signal processing. ESA

N76-27459# European Space Agency, Paris (France).
POSSIBILITIES AND LIMITATIONS OF SATELLITE BROADCASTING SYSTEMS FOR DEVELOPING COUNTRIES
C. Rosetti 1975 14 p Presented at the UN/UNESCO Reg. Seminar for Latin Am. on Satellite Broadcasting Systems for Educ. and Develop., Mexico City, 2-11 Sep. 1975
Avail: NTIS HC $3.50

The technical backgrounds and their limitations for establishing direct satellite broadcasting systems in developing countries are discussed. A comparison is made between ground and orbiting transmitters. Possible satellite systems and their economics are described. Problems connected with the definition of the satellite service zone are reviewed. Attenuation due to rainfall is mentioned as a factor affecting the choice and development of the system. ESA

N76-27460# European Space Agency, Paris (France).
A POSSIBLE EVOLUTION OF THE EUROPEAN COMMUNICATION SATELLITE SYSTEM
T. F. Howell and S. Hanell 1975 8 p Presented at the Telecom 75, Geneva, 6-8 Oct. 1975
Avail: NTIS HC $3.50

A number of future European communications service needs are outlined. One of these, communication to oil exploration and production platforms in the North Sea and the Celtic Sea, is described in detail. ESA

N76-27461# Naval Electronics Lab. Center, San Diego, Calif.
EFFECTIVE IONOSPHERIC HEIGHT FOR A SIMPLIFIED MODE CONVERSION MODEL AT VLF Interim Report
Richard A. Pappert and Linda R. Shockey 1 Nov. 1975 71 p refs
(DNA Proj. NWED-HB042; NELC Proj. M402)
(AD-A020642; NELC-IR-761) Avail: NTIS CSCL 20/4

This report generalizes an earlier program for calculating the effects on signal level of mode conversion at VLF/LF frequencies in the earth-ionosphere waveguide. The generalizations are (1) horizontal inhomogeneities are allowed to pass over the transmitter; and (2) the height parameter above which the height gains are discarded and below which the height gains are replaced by a linear combination of Airy functions is allowed to vary from slab to slab. Several methods of selecting the height parameters are examined. Although no one method appears to be superior, the reference height defined by Wait in his studies of exponential profiles, because of ease of implementation, is the preferred method. The present program will yield generalized mode conversion coefficients and a mode sum plot for ground based vertical electric dipole excitation of the vertical electric field at the ground as a function of transmitter-receiver distance or as a function of location of the horizontal inhomogeneity relative to the transmitter for fixed point transmissions. GRA

N76-27462# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
SELECTED PROBLEMS IN THE THEORY OF ELECTROMAGNETIC RADIATION Final Report, 31 Mar. 1971 - 31 Aug. 1974
C. H. Papas Oct. 1975 10 p refs
(Grant AF-AFOSR-1935-70; AF Proj. 9768)
(AD-A020632; AFOSR-76-0002TR) Avail: NTIS CSCL 20/14

Electromagnetic interactions in space-time dependent media are investigated with applications to sinusoidal periodic dielectrics and plasmas and with the display of numerous radiation patterns. The coupled wave and Floquet approaches to periodic waveguides are compared and applied to distributed feedback lasers. Transient radiation problems are solved for a variety of systems - e.g. the cylindrical monopole by the Wiener-Hopf technique, infinitely long and finite cylindrical antennas, loop antennas by varied heuristic procedures; strong electromagnetic pulses at the boundary of a nonlinear plasma; and radiation of electromagnetic waves from oscillating sources in a suddenly created plasma. Models for transition radiation are investigated. New methods are developed for electromagnetic field calculations - the nonuniform lossless transmission line is treated by introducing a nonorthogonal warped coordinate system; a differential geometry scaling method is devised and applied to coaxial waveguide structures; and a shielding theory is constructed for metallic enclosures with apertures. The inverse scattering algorithm is derived and applied

to calculating the electron density profile of the ionospheric plasma. GRA

N76-27463# Dikewood Corp., Albuquerque, N.Mex.
ELECTROMAGNETIC FIELD PENETRATION THROUGH APERTURES Final Report, Nov. 1973 - Jun. 1974
B. D. Graves, T. T. Crow, and C. D. Taylor Kirtland AFB, N. Mex. AFWL Jul. 1975 76 p refs Prepared in cooperation with Mississippi State Univ., Mississippi State
(Contract F29601-74-C-0010)
(AD-A020487; AFWL-TR-74-199) Avail: NTIS CSCL 20/14

A numerical method is presented for determining the electromagnetic field diffracted by an aperture in an infinite conducting plate. Comparisons are made with the results of approximations valid at low frequencies and high frequencies. Calculations of the electromagnetic field components in the aperture, in the near zone of the aperture, and in the far zone of the aperture are made and compared with available measured data. To determine the electromagnetic pulse penetration through apertures the singularity expansion method is considered. Some preliminary data are presented. Finally the penetration of the electromagnetic field through apertures into cavities is discussed. Author (GRA)

N76-27464# Office of Telecommunications, Washington, D.C.
TELECOMMUNICATIONS SUBSTITUTABILITY FOR TRAVEL, AN ENERGY CONSERVATION POTENTIAL. APPENDIX A Final Report
Joseph R. Bewick Jan. 1975 150 p refs
(Contract DI-14-01-0001-2058)
(PB-249511/7; FEA/D-76/012) Avail: NTIS HC $6.00 CSCL 17B

Telecommunications has the potential of conserving energy to a significant degree by substituting for the information handling functions currently being performed through the use of transportation. Two means of energy saving are explored: (1) decentralization of work forces, which would reduce commuter travel; and (2) the increased use of telecommunications by existing work forces in their current organizational structures. Energy consumption by telecommunications and transportation is explored as are the nature of the work forces and the factors influencing travel. Teleconferencing, both in the United States and abroad, is reviewed. GRA

N76-27465# Harry Diamond Labs., Adelphi, Md.
DELAYED POSITION SCORING SYSTEM
Gregory V. Cirincione Dec. 1975 15 p
(DA Proj. 1Y6-65709-D-650)
(AD-A020643; HDL-TM-75-26) Avail: NTIS CSCL 20/5

A method and apparatus for nondestructively evaluating the performance of a weapon system are described. The unique concept embodied in the Delayed Position Scoring System provides nondestructive scoring of weapon systems during simulated battlefield testing and also provides a technique of nearly total simulation of the gun laying and firing of a real weapon system. The system includes a gun, a laser, and a radar, all of which are mounted on separate and independently operable pedestals. Utilizing the predicted projectile intercept point determined by the weapon fire control device, a laser control device positions the laser pedestal so that at the end of time of the flight of the projectile, the laser is positioned towards the predicted point. The laser is fired by the control device at the precise moment in time corresponding to the predicted intercept time of the projectile and target. The resultant hit or miss information, which may, for example, be obtained by means of a laser receiver mounted on the target, is indicative of the total operational evaluation of the weapon system including the weapon's target acquisition and tracking devices and the prediction, gun laying, and projectile performance of the system. Author (GRA)

N76-27466# Illinois Univ., Urbana. Dept. of Computer Science.
AN ANALYSIS OF BURST ENCODING METHODS AND TRANSMISSION PROPERTIES M.S. Thesis
Gary Lewis Taylor Dec. 1975 88 p refs
(Contract N00014-75-C-0982)
(AD-A021070; UIUCDCS-R-75-770) Avail: NTIS CSCL 09/4

This paper describes the performance of a class of unweighted binary number representations. One of these, called burst processing, has been proposed as a compromise between stochastic and weighted-binary number representation for digital systems. Encoders, digital filters, and error correcting circuitry for these inherently redundant representations are discussed. Used as channel codes, these representations out-perform conventional error-correcting codes only in unusual circumstances. Their usefulness lies in the simplicity of the hardware required to accomplish digital signal processing tasks. GRA

N76-27467# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
ENVIRONMENT AND RADAR OPERATION SIMULATOR Quarterly Report, 1 Apr. - 30 Jun. 1975
S. N. Cole, A. R. Clayton, E. R. Flynt, and R. C. Michelson Sep. 1975 33 p refs
(Contract DAAB07-74-C-0272; DA Proj. 1S7-62703-DH-93-P1-06)
(AD-A021073; ECOM-74-0272-4; QR-4) Avail: NTIS CSCL 17/9

The report summarizes activities during the fourth quarter of a program directed toward design and fabrication of an Environment and Radar Operation Simulator (EROS). Detailed design was begun on the EROS feasibility model in three areas: the digital processor, computer software, and analog hardware. In the digital processor area, specifications have been formulated for the key simulation parameters including sampling rates and simulation scenario dimensions. A block diagram of the digital processor is presented with descriptions of its major building blocks. Specification of EROS software requirements was begun during the quarter, and the major software subsystems are identified. Definitions of scenario description and scenario compilation are presented at the block diagram level. Requirements for the other subsystems are described in general terms. The design of the analog hardware has proceeded to the block diagram level including signal synthesis at various frequencies, synchronization, and the signal interfaces to the radar. GRA

N76-27468# Naval Research Lab., Washington, D.C.
TRACKING SYSTEM FOR ASYNCHRONOUSLY SCANNING RADARS WITH NEW CORRELATION TECHNIQUES AND AN ADAPTIVE FILTER Interim Report
Ben H. Cantrell and Jon D. Wilson 14 Jan. 1976 30 p refs
(NRL Proj. R02-54; RF12151403)
(AD-A020540; NRL-7952) Avail: NTIS CSCL 17/9

An Automatic Detection and Integrated Tracking system (ADIT) is being developed at NRL using the video outputs of two asynchronously scanning search radars located in close proximity. The automatic detectors should provide good false-alarm regulation over a variety of environmental conditions. The tracking system uses an adaptive alpha-beta filter to develop a single track file from the detections from the two radars. The tracking system differs from previous single-radar tracking systems in the timing, filter update, correlation process, and track initiation as well as in the use of detections from two radars. The system has been operated against targets of opportunity at NRL's CBD facility and can maintain tracks on 50 to 60 targets in real time. GRA

N76-27469# Naval Weapons Center, China Lake, Calif.
THE 95-GHz RADAR MEASUREMENTS
J. W. Battles Nov. 1975 34 p refs
(AD-A020547; NWC-TP-5803) Avail: NTIS CSCL 17/9

A 95-GHz radar was operated in a pulsed and a continuous-wave Doppler mode to demonstrate its ability to map, detect, and identify specific targets. GRA

N76-27470# Stanford Research Inst., Menlo Park, Calif.
INDUCED-CURRENT INTERACTION WITH WAVES Final Technical Report, 1 Aug. 1974 -31 Jan. 1975
K. A. Graf, D. E. Tremain, and H. Guthart Apr. 1975 52 p refs
(Contract N00014-73-C-0444; ARPA Order 2185; SRI Proj. 2621)
(AD-A020163) Avail: NTIS CSCL 17/9

Microwave measurements have been made with a coherent radar in a wind-wave tank to determine the effect of induced

current on backscatter. Perturbations were introduced into the wave structure by inducing a current in the water that flowed either with or against the wind. The effect of current on cross section was slight; the effect on the Doppler was much more pronounced. It was found that the wave components responsible for radar backscatter are predominantly free waves (that is, waves which travel at the dispersion velocity) rather than waves which are parasitic to (or locked to) the dominant waves.Author (GRA)

N76-27471# Technology Service Corp., Santa Monica, Calif.
SYNTHETIC APERTURE RADAR SIGNALS: FORMULATIONS AND APPROACHES FOR DATA ANALYSIS Final Report
Antonio B. Lucero, Peter Swerling, and Leo Breiman May 1975 127 p refs Supersedes TSC-PD-134-1
(Contract N00014-75-C-0088; NR Proj. 048-625)
(AD-A021181; TSC-PD-134-2; TSC-PD-134-1) Avail: NTIS CSCL 17/9

This report discusses principles of synthetic aperture radar, properties of radar targets, characteristics of radar imagery, statistical analysis of radar imagery, and the application of modern data analysis. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N76-27472* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SWITCHABLE BEAMWIDTH MONOPULSE METHOD AND SYSTEM Patent
Leonard F. Deerkoski and Richard F. Schmidt, inventors (to NASA) Issued 22 Jun. 1976 12 p Filed 30 May 1975 Supersedes N75-26252 (13 - 17, p 2106)
(NASA-Case-GSC-11924-1; US-Patent-3,965,475; US-Patent-Appl-SN-582318; US-Patent-Class-343-854; US-Patent-Class-343-779; US-Patent-Class-343-755) Avail: US Patent Office CSCL 09C

A switchable beamwidth monopulse method and system are described. An antenna comprising a curved reflector and a first set of monopulse feeds positioned in the effective region of the airy disc of the antenna includes a second set of monopulse feeds. The second set of monopulse feeds is positioned outside the airy disc in the region of first bright airy ring. In narrow beamwidth monopulse operation, monopulse sum and difference channel patterns are obtained from the first set of feeds within the airy disc. In wide beamwidth monopulse operation, the difference channel pattern is obtained from the second set of feeds in the airy ring; the sum channel pattern is obtained by attenuation and phase shifting the sum channel signal obtained from the first set of feeds, and adding the resultant to the sum channel signal obtained from the second set of feeds. In a simplified form of the invention, the difference channel patterns for both narrow and wide beamwidth mode operation are obtained from the second set of feeds, while the sum channel patterns are obtained as described above.
Official Gazette of the U.S. Patent Office

N76-27473* National Aeronautics and Space Administration, Washington, D.C.
RESISTIVE ANODE IMAGE CONVERTER Patent
Michael L. Lampton (Calif. Univ., Berkeley) and Francesco Paresce, inventors (to NASA) (Calif. Univ., Berkeley) Issued 22 Jun. 1976 6 p Filed 3 Mar. 1975 Sponsored by NASA
(NASA-Case-HQN-10876-1; US-Patent-3,965,354; US-Patent-Appl-SN-555336; US-Patent-Class-250-336; US-Patent-Class-250-372) Avail: US Patent Office CSCL 09C

The invention of an apparatus for imaging soft X-ray and ultraviolet electromagnetic radiation and charged particles was described. The apparatus includes a pair of microchannel electron multiplier plates connected in a cascaded chevron configuration which intercepts an incident beam of radiation or charged particles. Incident photons or charged particles strike the front surface of the chevron configuration causing emission of electrons. The electrons are accelerated by a voltage gradient and strike the inner side walls of the individual channels, causing emission of secondary electrons. Accelerated and multiplied secondary electrons impinge upon a resistive anode after they transverse the chevron configuration. A pulse position circuit converts the magnitude or transit time of the currents flowing from the point of impact of the electrons on the resistive anode to four contact electrodes mounted on their periphery of the resistive anode into the spatial coordinates of electron impact.
Official Gazette of the U.S. Patent Office

N76-27474*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REGULATION OF A LIGHTWEIGHT HIGH EFFICIENCY CAPACITATOR DIODE VOLTAGE MULTIPLIER dc-dc CONVERTER
William T. Harrigill, Jr. and Ira T. Myers 1976 9 p refs Presented at the Power Electron- Specialists Conf., Cleveland, 8-10 Jun. 1976; sponsored by IEEE
(NASA-TM-X-73427; E-8768) Avail: NTIS HC $3.50 CSCL 09C

A method for the regulation of a capacitor diode voltage multiplier dc-dc converter has been developed which has only minor penalties in weight and efficiency. An auxiliary inductor is used, which only handles a fraction of the total power, to control the output voltage through a pulse width modulation method in a buck boost circuit. Author

N76-27475*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ULTRASONIC EVALUATION OF HIGH VOLTAGE CIRCUIT BOARDS
Stanley J. Klima and Thomas J. Riley 1976 11 p refs Presented at Power Electronics Specialists Conf., Cleveland, 8-10 Jun. 1976; sponsored by IEEE
(NASA-TM-X-73432; E-8779) Avail: NTIS HC $3.50 CSCL 09C

Preliminary observations indicate that an ultrasonic scanning technique may be useful as a quick, low cost, nondestructive method for judging the quality of circuit board materials for high voltage applications. Corona inception voltage tests were conducted on fiberglass-epoxy and fiberglass-polyimide high pressure laminates from 20 to 140 C. The same materials were scanned ultrasonically by utilizing the single transducer, through-transmission technique with reflector plate, and recording variations in ultrasonic energy transmitted through the board thickness. A direct relationship was observed between ultrasonic transmission level and corona inception voltage. The ultrasonic technique was subsequently used to aid selection of high quality circuit boards for the Communications Technology Satellite.
Author

N76-27476*# Bendix Corp., Teterboro, N.J. Gyroscopic Devices Lab.
HIGH TORQUE DC MOTOR FABRICATION AND TEST PROGRAM Final Report
Paul Makus 24 May 1976 140 p
(Contract NAS8-30970)
(NASA-CR-144348) Avail: NTIS HC $6.00 CSCL 09A

The testing of a standard iron and standard alnico permanent magnet two-phase, brushless dc spin motor for potential application to the space telescope has been concluded. The purpose of this study was to determine spin motor power losses, magnetic drag, efficiency and torque speed characteristics of a high torque dc motor. The motor was designed and built to fit an existing reaction wheel as a test vehicle and to use existing brass-board commutation and torque command electronics. The results of the tests are included in this report. Author

N76-27477*# District of Columbia Teachers College, Washington, D.C.
METHODS FOR TESTING HIGH VOLTAGE CONNECTORS IN VACUUM, MEASUREMENTS OF THERMAL STRESSES

IN ENCAPSULATED ASSEMBLIES, AND MEASUREMENT OF DIELECTRIC STRENGTH OF ELECTRODES IN ENCAPSULANTS VERSUS RADIUS OF CURVATURE Final Technical Report, 15 Apr. 1975 - 15 Apr. 1976
Renate S. Bever 15 Apr. 1976 119 p refs
(Grant NGR-09-053-003)
(NASA-CR-148322) Avail: NTIS HC $5.50 CSCL 09A

Internal embedment stress measurements were performed, using tiny ferrite core transformers, whose voltage output was calibrated versus pressure by the manufacturer. Comparative internal strain measurements were made by attaching conventional strain gages to the same type of resistors and encapsulating these in various potting compounds. Both types of determinations were carried out while temperature cycling from 77 C to -50 C. Author

N76-27478# Electrotechnical Lab., Tokyo (Japan).
CONTROL OF THE SPARK GAP SWITCH BY RADIATION
Takuya Noguchi Nov. 1976 108 p refs In JAPANESE; ENGLISH summary
(Rept-756) Avail: NTIS HC $5.50

There is an urgent need to develop high-speed switches with high reliability in various fields, for example in nuclear fusion and high energy physical experiments. The spark gap is a high-power and high-speed switch. An outstanding advantage of the spark gap switch controlled by irradiation is that the controlling electronics are completely isolated from the switch. Systematical investigation into control of the gap switch by irradiation is presented. Author

N76-27479*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Applied Mechanics Div.
FIVE METER DIAMETER CONICAL FURLABLE ANTENNA
J. W. Fortenberry, R. E. Freeland, and D. M. Moore 15 Jul. 1976 35 p refs
(Contract NAS7-100)
(NASA-CR-148457; JPL-TR-32-1604) Avail: NTIS HC $4.00 CSCL 09C

An investigation was made to demonstrate that a 5-meter-diameter, furlable, conical reflector antenna utilizing a line source feed can be fabricated utilizing composite materials and to prove that the antenna can function mechanically and electrically as prototype flight hardware. The design, analysis, and testing of the antenna are described. An RF efficiency of 55% at 8.5 GHz and a surface error of 0.64 mm rms were chosen as basic design requirements. Actual test measurements yielded an efficiency of 53% (49.77 dB gain) and a surface error of 0.61 mm rms. Atmospherically induced corrosion of the reflector mesh resulted in the RF performance degradation. An assessment of the antenna as compared to the current state of the art technology was made. This assessment included cost, surface accuracy and RF performance, structural and mechanical characteristics, and possible applications. Author

N76-27480*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH AND LOW THRESHOLD P-CHANNEL METAL OXIDE SEMICONDUCTOR PROCESS AND DESCRIPTION OF MICROELECTRONICS FACILITY
David L. Bouldin, William R. Feltner, Ben R. Hollis, and Donald E. Routh Washington Jul. 1976 45 p refs
(NASA-TR-R-465) Avail: NTIS HC $4.00 CSCL 09C

The fabrication techniques and detail procedures for creating P-channel Metal-Oxide-Semiconductor (P-MOS) integrated circuits at George C. Marshall Space Flight Center (MSFC) are described. Examples of P-MOS integrated circuits fabricated at MSFC together with functional descriptions of each are given. Typical electrical characteristics of high and low threshold P-MOS discrete devices under given conditions are provided. A general description of MSFC design, mask making, packaging, and testing procedures is included. The capabilities described in this report are being utilized in: (1) research and development of new technology, (2) education of individuals in the various disciplines and technologies of the field of microelectronics, and (3) fabrication of many types of specially designed integrated circuits which are not commercially feasible in small quantities for in-house research and development programs. Author

N76-27481# Sandia Labs., Albuquerque, N.Mex.
THERMAL AND MECHANICAL LIMIT STUDY FOR SANDIA LABORATORIES GENERATION 1 AND 2 HYBIRD MICROCIRCUIT TECHNOLOGY
H. C. Olson Nov. 1975 63 p
(Contract AT(29-1)-789)
(SAND-75-0285) Avail: NTIS HC $5.45

Samples of chip capacitors epoxied to chrome-gold metallized substrates using thermocompression bonded .0254 mm gold flying wire interconnections; thermocompression bonded integrated circuits; wire and ribbon thermocompression bonded crossovers; and soldered chip capacitors were subjected to the mechanical and thermal environments as specified in MIL-STD-883, method 5006, 'limited testing.' In addition, some samples were aged at 150 C for 1000 h prior to experiencing the environmental test series. The purpose for 'limit testing' is to establish the maximum mechanical and thermal capabilities of the Sandia Laboratories hybrid microcircuit technology. This evaluation indicated that the present hybrid technology will survive extreme mechanical and thermal environmental conditions, except for long term aging of soldered components which have a significant detrimental effect on solder joint strength. Author (ERA)

N76-27482# GTE Sylvania, Inc., Needham Heights, Mass. Communication Systems Div.
A 100-kA DIRECT DRIVE EMP PULSER
J. E. Allen Jul. 1975 29 p Sponsored by ERDA
(PEM-39) Avail: NTIS HC $5.00

A pulser is described which was built to directly drive 100 kA into a Minuteman silo closure seal. The pulser has a 50-kV charge voltage, a 10-nanosecond rise time and a 50 microsecond fall time. Physical features and performance characteristics are described along with a summary of its successful operation in pulsing the silo cover. Author (NSA)

N76-27483# California Univ., Livermore. Lawrence Livermore Lab.
ABSORPTION OF SHORT-PULSE ELECTROMAGNETIC ENERGY BY A RESISTIVELY LOADED STRAIGHT WIRE
E. K. Miller, F. J. Deadrick, and J. A. Landt 17 Oct. 1975 23 p refs
(Contract W-7405-eng-48)
(UCRL-51936) Avail: NTIS HC $4.00

Energy collected by the wire, load energy, peak load currents, and peak load voltages are found for a wide range of parameters, with particular emphasis on nuclear electromagnetic pulse phenomena. A series of time-sequenced plots is used to illustrate pulse propagation on wires when loads and wire ends are encountered. Author (NSA)

N76-27484# Los Alamos Scientific Lab., N.Mex.
SOME PROPERTIES OF CASTOR OIL AFFECTING ITS PERFORMANCE AS A CAPACITOR IMPREGNANT AND THEIR SIGNIFICANCE TO FUTURE IMPREGNANT RESEARCH
G. P. Boicourt 1975 7 p refs Presented at 6th Symp. on Engr. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract W-7405-eng-36)
(LA-UR-75-2150; Conf-751125-50) Avail: NTIS HC $4.50

For a considerable time castor oil and polychlorinated biphenyl (PCB) were the principal impregnants used in energy-storage capacitors. Castor oil has proven to be better than PCB for pulsed applications. PCB's have come under attack as an environmental hazard, while castor oil is a vegetable product and its supply and quality are subject to fluctuation. These two facts make the development of new impregnants desirable. The properties of PCB as a capacitor impregnant are well known. A number of properties of castor oil and PCB's are compared. A comparison is made between the lives of castor oil capacitors and comparable PCB energy-storage capacitors. Some of the physical and chemical properties of castor oil which make it a good pulse capacitor impregnant are examined. Author (NSA)

N76-27485# Los Alamos Scientific Lab., N.Mex.
SEMIEMPIRICAL CABLE DESIGN
G. P. Boicourt Dec. 1974 8 p refs
(Contract W-7405-eng-36)
(LA-5691) Avail: NTIS HC $4.00

Coaxial cables are used extensively on controlled thermonuclear research at voltages much higher than manufacturers' ratings. The question of how such a cable should be designed is not easily answered. An approach to the problem is described that combines empirical knowledge and mathematical analysis. The result is an algorithm that will compute the optimal cable size for a cable having a given inductance, a given peak operating voltage, and a given maximum electric field strength in the dielectric. Suggestions for future cable research and development are given. Author (NSA)

N76-27486# Sandia Labs., Albuquerque, N.Mex.
FABRICATION OF A FERROELECTRIC GATE MEMORY TRANSISTOR
W. W. Grannenmann 1975 7 p refs Presented at the IEEE Intern. Electron Devices Meeting, Washington, D. C., Sponsored in part by ERDA, and NSF
(SAND-75-7081; Conf-751206-3) Avail: NTIS HC $4.50

Transistors were fabricated using a sputtered barium titanate dielectric for the gate insulator. The insulator shows two polarization states. It is possible to have normal field effect transistor characteristics in one state and the transistor turned off in the other state. These transistors may be useful in memory applications. Author (ERA)

N76-27487# Commissariat a l'Energie Atomique, Saclay (France).
PROGRAMMED DEVICE FOR THE MEASUREMENT OF THE "DEGREE OF STABILIZATION" (FUNCTIONING ERROR) OF A CONTINUOUS MULTISOURCE POWER SUPPLY (LESS THAN OR EQUAL TO 6) AS A FUNCTION OF THE VARIATIONS OF THE NETWORK VOLTAGE, OUTPUT YIELD, AND TEMPERATURE. SAMAS 6 SYSTEM
C. Ringeard and J. C. Vuillemin 25 Jan. 1973 37 p refs In FRENCH
(NP-20733) Avail: ERDA Depository Libraries HC $5.00

The SAMAS 6 System is principally intended for the measurement of regulated power supply load, voltage regulation, and temperature coefficient. Six power supplies can be simultaneously measured. A program operates the measurement cycle, supplies the results on a teleprinter, and estimates the measurement accuracy. Author (ERA)

N76-27488# Technische Hochschule, Darmstadt (West Germany). Fachgebiet Uebertragungstechnik.
THE JOINING OF TWO NONCORRELATED ELECTRIC POWER CURRENTS WITHOUT USING FREQUENCY-DEPENDENT ELEMENTS [UEBER DIE ZUSAMMENFUEHRUNG VON ZWEI NICHT KORRELIERTEN ELEKTRISCHEN LEISTUNGSSTROEMEN OHNE VERWENDUNG VON FREQUENZABHAENGIGEN ELEMENTEN]
Guenter Morgenstern Dec. 1974 29 p refs In GERMAN
(IND-FB-67) Avail: NTIS HC $4.00

The problem of feeding two electric power currents from two noncorrelated transmitters, e.g. audio and video in TV broadcasting on line, e.g. the antenna feedline, with lowest possible losses and without using frequency-dependent elements, is discussed. The necessary absorption and reflection losses, resulting from the energy conservation law, are calculated. The matching and decoupling conditions of the individual ports of the threeport, used for power joining, as a result of the energy conservation law and the reciprocity law, are also calculated. Circuits are indicated, proving the feasibility of applying the conditions resulting from both laws. ESA

N76-27489# Siemens A.G., Munich (West Germany).
GALLIUM ARSENIDE TECHNOLOGY FOR MONOLITHIC INTEGRATION Final Report [GALLIUMARSENID - TECHNOLOGIE FUER MONOLITHISCHE INTEGRATION]
Hermann Kniepkamp Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1975 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-41) Avail: NTIS HC $5.00; ZLDI, Munich DM 17,65

The gallium arsenide Schottky field effect transistor was taken as a vehicle for the development of a gallium arsenide technology for monolithic integration. The developed technology comprises: the epitaxy of layers on semiinsulating substrates with thicknesses well in the submicron region, the photolithography and metallization technique for Schottky contacts and ohmic contacts, and the bonding and packaging of the device in a housing suited for microwave application. Microwave measurements characterize the FET as a device with fm = 40 GHz, 10 dB MAG at 10 GHz and a minimum NF of 4 dB at 8 GHz with an associated gain of 5 dB. Additionally SiO2 - layers were sputtered onto GaAs substrates. The results obtained prove these layers to be suited for application in an integrated circuit on GaAs. Author (ESA)

N76-27490# Siemens A.G., Munich (West Germany). Werk fuer Halbleiter.
NEW TECHNOLOGY FOR MANUFACTURING SILICON HIGH VOLTAGE DIODES Final Report [NEUE TECHNOLOGIE DER HERSTELLUNG VON HOCHSPANNUNGSDIODEN AUS SILIZIUM]
Udo Lob Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1975 32 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin fuer Forsch. u. Technol.
(BMFT-FB-T-75-45) Avail: NTIS HC $4.00; ZLDI, Munich DM 6,75

A rational method of preparation was developed for cheap high voltage diodes with the following specifications: VRRM = 15 kV, IFAV = 5mA, f = 20 kHz. Several diffused silicon slices are stacked and soldered together by RF heating. Then they are divided by wire-cutting. A jig-system was developed for the mounting of the diodes which can be employed during the contacting, etching, passivating, molding, and testing of the diodes. The failure rate of these diodes under severe operating conditions is of the order of 6 per million/h. Author (ESA)

N76-27491# Technische Hochschule, Darmstadt (West Germany). Fachgebiet Elektroakustik.
THE CURRENT-VOLTAGE RESISTANCE EQUIVALENT CIRCUIT DIAGRAM OF ELECTRETS [DAS STROM-SPANNUNGS-WIDERSTANDS-ERSATZSCHALTBILD VON ELEKTRETEN]
Guenter Morgenstern Jul. 1975 30 p refs In GERMAN
(IND-FB-77) Avail: NTIS HC $4.00

The diagram, proposed for one-dimensional electrets, reduces the boundary value problem of electrostatics, i.e. calculation of electric fields in electrets from electric and geometric data, to a network analysis problem with ohmic resistances, current and voltage sources. ESA

N76-27492# Technische Hochschule, Darmstadt (West Germany). Fachgebiet Uebertragungstechnik.
OPERATIONAL SCATTERING MATRIX AND POWER EFFICIENCY SCATTERING MATRIX [BETRIEBS-STREUMATRIX UND WIRKLEISTUNGS-STREUMATRIX]
Guenter Morgenstern Jul. 1975 10 p ref In GERMAN
(IND-FB-78) Avail: NTIS HC $3.50

The matrices are defined and their relationship established. Definitions were made for a linear source with internal resistance, for which the scattering variables depend linearly and homogeneously on the complex voltage and the complex current according to certain relationships. ESA

N76-27493# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
RESEARCH AND DEVELOPMENT ON A CORRELATOR FOR EDUCATION PURPOSES [CORRELATEUR DESTINE A L'ENSEIGNEMENT. ETUDE ET REALISATION]
J. Lienard and D. Mathieu 21 Jul. 1975 32 p In FRENCH
(CEPHAG-37/75) Avail: NTIS HC $4.00

A low cost correlator for student training is presented. Various designs are compared, and the reasons for choosing a numerical correlator are given. The concept and implementation of the various elements are detailed. A user manual is included. The device calculates auto or intercorrelation functions for 256 points, the input being two channels quantified with 16 levels. The sampling frequency in real time operation is 4 KHz while the maximum sampling frequency is 1 MHz. ESA

N76-27494# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
IDENTIFICATION OF A MEDIUM AND TEST OF STATIONARINESS BY I/O TREATMENT OF A NOISE EMISSION [IDENTIFICATION DE MILIEU ET TEST DE STATIONNARITE

PAR TRAITEMENT ENTRE-SORTIE LORS D'UNE EMISSION DE BRUIT]
B. Faure and G. Jourdain 21 Oct. 1975 78 p refs In FRENCH
(CEPHAG-43/75) Avail: NTIS HC $5.00

A first order estimation of the mean response value from reverberating media upon noise signal emission is described. The theoretical basis of the work is detailed. The treatment method is cross correlation between input and output data and statistical mean. Theoretical forecasts on results are compared with experimental results on deterministic and random media both in the case of numerical and analog treatment. ESA

N76-27495# Centre National d'Etudes Spatiales, Toulouse (France).
NONLINEARITY OF TRAVELING WAVE TUBES [NONLINEARITIES DES TUBES A ONDE PROGRESSIVE]
Jacques Sombrin Jan. 1976 76 p refs In FRENCH; ENGLISH summary
(CNES-NT-28) Avail: NTIS HC $5.00

The amplitude and phase nonlinearities of the Travelling Wave Tube Amplifier (TWTA) and their effects on signals (intermodulation products, AM/PM conversion, crosstalk) are discussed. The measure of TWTA characteristics, their mathematical representation by polynomials and a theoretical analysis gave the values of intermodulation products in the case of two unmodulated carriers. A program for computer simulation of TWTA nonlinearities was defined, and the signal to noise ratio of a communication channel was computed. Nonlinearities of TWTA with different delay time structures and linearization methods were compared. ESA

N76-27496# Microwave Inst. Foundation (MIF), Stockholm (Sweden).
AN EVALUATION PROGRAMME FOR THE SPACE APPLICATION OF AN AVALANCHE DIODE Final Report
Florian Sellberg Mar. 1976 59 p refs Prepared for Swed. Natl. Defence Res. Inst.
(Contract ESTEC-2139/73-MS)
(ESA-CR(P)-806) Avail: NTIS HC $4.50

An evaluation program of a double drift region silicon Impatt diode to be used in satellite communication is presented. The specifications of the diode are operating frequency range 11 to 13 GHz, operating voltage 113 to 117 V, operating current 25 to 40 mA, output 0.3 to 0.6 W, efficiency 10.5 to 12.7 %. The reliability target was a failure rate less than 300 FIT during a 7-year life in space. Design, development, and production of the Avalanche diode are described and performance and reliability test methods are discussed. The different tests and failure analyses were evaluated and recommendations for future space qualification and application were made. ESA

N76-27497# Thomson-CSF, Velizy (France). Div. Tubes Electroniques.
CROSSED FIELD AMPLIFIER FOR SPACE APPLICATION Final Report [ETUDE D'UN AMPLIFICATEUR A CHAMPS CROISES POUR APPLICATIONS SPATIALES]
R. Gerber, J. Morizot, and L. Teyssier Dec. 1975 85 p In FRENCH
(Contract ESA-SC/69-HQ)
(RT-1563-T; ESA-CR(P)-809) Avail: NTIS HC $5.00

A crossed field amplifier tube (carpitron) was constructed based on a previously manufactured tube, aiming at an improvement of the fine characteristics and of efficiency. This was obtained by increasing the coupling impedance up to the technological limit. A further improvement of the delay line characteristics resulted in a 300 W tube with an efficiency of near 39 %, between 11.7 and 12.5 GHz. ESA

N76-27498# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Aug. - 31 Oct. 1975
Melvin A. Herlin and Alan L. McWhorter 15 Nov. 1975 21 p
(Contract F19628-76-C-0002; AF Proj. 649L)
(AD-A020959; ESD-TR-75-312) Avail: NTIS CSCL 20/12

Contents: Integrated Circuit Processing; Solid State Device Research; Quantum Electronics; Materials Research; Microelectronics; and Surface-Wave Technology. GRA

N76-27499# Air Force Weapons Lab., Kirtland AFB, N.Mex.
COMPLEMENTARY METAL OXIDE SEMICONDUCTOR HARDENED FUNCTIONS AND RADIATION FAILURE CRITERIA Final Report, 1 Aug. 1973 - 15 Nov. 1974
Robert J. Antinone and James D. Ledbetter Aug. 1975 52 p refs
(DNA Proj. NWED-QAXTD033)
(AD-A020752; AFWL-TR-75-69) Avail: NTIS CSCL 20/12

Various methods for designing radiation-hardened large-scale integrated circuits in the complementary metal oxide semiconductor technology are discussed. Recommendations are made as to which approaches should be pursued. Examples of required functions are given. Next, approximate failure criteria are generated. These failure criteria allow measurements on individual field effect transistors to be used to predict failure levels in large-scale arrays. Failure criteria are related to excessive power dissipation, loss of noise margin, and degraded switching speeds. Finally, some specific circuit designs are considered. Transmission gates and 4-input NAND gates are studied. Author (GRA)

N76-27500# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE OPTIMUM CONTROL IN A LONG LINE OF POWER TRANSMISSIONS
Yu. I. Lunkina 8 Dec. 1975 21 p Transl. into ENGLISH from TR. Frunzenskogo Politeknicheskogo Inst. Energetika (USSR), no. 50, 1971 p 183-193
(AD-A019140; FTD-ID(RS)I-2304-75) Avail: NTIS CSCL 10/2

The control theory applicable to a long power transmission line was examined, using an integral quadratic criterion for optimization. The equations describing the system were presented, assuming that the transmission line includes both concentrated and distributed parameters, and including models for the generator, transformers, and the long line itself. The optimization was performed using, as control quantity, the excitation voltage of the generator. The wave processes taking place in the line were described by partial differential equations with appropriate initial and boundary conditions; it was assumed that, at both ends of the line, there are receivers with ohmic and inductive resistances. It was shown that solution of the optimization problem is reducible to solution of the Riccati equation. Y.J.A.

N76-27501# Westinghouse Research Labs., Pittsburgh, Pa.
RELIABILITY EVALUATION OF POLYMER COATED MU-CHIP MULTI-LEVEL MICROELECTRIC ASSEMBLIES Final Technical Report, 21 Mar. 1974 - 30 Sep. 1975
John R. Szedon and Thomas A. Temofonte Dec. 1975 124 p refs
(Contract F30602-74-C-0161; AF Proj. 5519)
(AD-A020851; Rept-75-6G3-CEMMO-RI; RADC-TR-75-315) Avail: NTIS CSCL 09/5

The purpose of this program was to consider reliability factors relating to polymer coated, beam lead chip, hybrid microcircuits fabricated on substrates with multi-level conductors. Such assemblies were considered as a means to reduce the cost and volume of conventional electronic subsystems using discrete microcircuits in hermetic packages. Monolithic large scale integration (LSI) is one potential means of achieving the desired goals, but it involves difficulties in testing, it is not repairable, and it becomes economical only in large production volumes. Hybrids permit using less complex circuit chips produced with high yield and at lower cost than LSI circuits. Such hybrids could be tested during assembly and malfunctioning chips could be replaced before final encapsulation as necessary. Beam lead contacts offer potential economies in contact bonding and improved reliability. Multi-level conductor substrates should provide the interconnection complexity needed to realize the desired electronic functions. The use of silicon nitride over silicon dioxide as the primary passivation on beam lead circuit chips should be given higher reliability as regards surface related failures. GRA

N76-27502# Wentworth Inst., Boston, Mass.
SUPPORT DEVICES FOR SOUNDING ROCKET INSTRUMENTATION SYSTEMS. UNIVERSAL TIME DELAY AND AUTOMATIC TEST SYSTEM
Robert W. Charron 1 Apr. 1974 22 p

(Contract F19628-73-C-0232; AF Proj. 7659)
(AD-A020299; SR-1; AFCRL-TR-75-0108) Avail: NTIS CSCL 09/5

Relays, checkout equipment, voltage, sampling Two devices have been designed and constructed for use as support equipment for sounding rocket instrumentation systems. The Universal Time Delay was developed to provide supplementary timing functions. The Automatic Test System was developed with the aim of conducting battery charge/discharge tests with a minimum number of man-hours, and with unattended operation for at least 75 hours. GRA

N76-27503# Rome Air Development Center, Griffiss AFB, N.Y.
METHOD OF MOMENTS APPLICATIONS. VOLUME 9: NEAR AND FAR FIELD THIN-WIRE COUPLING Technical Report, 1 Jul. 1973 - 30 Jun. 1975
Kenneth R. Siarkiewicz Jan. 1976 111 p refs
(AF Proj. 4540)
(AD-A020850; RADC-TR-73-217-Vol-9) Avail: NTIS CSCL 09/5

The method of moments formulation for electromagnetic fields analysis is applied to the antenna-to-antenna coupling problem. An easily measured definition of coupling is derived. The analysis technique and the definition are validated by the results of an extensive experimental program. Special approximate formulas suitable for hand calculation are developed for parallel thin-wire dipoles of length less than one-half wavelength, including very small antennas. Author (GRA)

N76-27504# Pennsylvania State Univ., University Park. Applied Research Lab.
QUADRATURE SAMPLED DIGITAL BANDPASS FILTER
D. E. Kerr and M. W. Lengyel 5 Aug. 1975 23 p refs
(Contract N00017-73-C-1418)
(AD-A020622; TM-75-209) Avail: NTIS CSCL 09/5

A digital bandpass filter having quadrature sampling is developed from N-th order bandpass sampling reconstruction theory. It is shown that the angular symmetry of the complex roots may be used to minimize the hardware and computational requirements in the quadrature realization. GRA

N76-27505# Naval Ship Research and Development Center, Bethesda, Md.
COAST-DOWN TIME AS A MECHANICAL CONDITION INDICATOR
Thomas L. Daugherty and Robert J. Craig Jan. 1976 40 p refs
(ZF61512001)
(AD-A020154; DTNSRDC-4547) Avail: NTIS CSCL 09/3

This initial report presents the development of a theoretical expression, and input for that expression, to predict the behavior of vertically mounted electric motors during coast-down. The coast-down behavior of four motors, equipped with grease-lubricated deep-groove ball bearings and operated at steady state under design conditions, is studied. The coast-down time (speed/time curve) is predictable by expessing the torque (M) on the rotor as a function of the speed (N) of the rotor in a quadratic of the form M - A + BN + CN2. It is demonstrated that the predictive capability developed herein can be used effectively to determine whether a motor is being operated under the desired design conditions. More experimental data will be obtained to confirm or refine the predictive technique. Mechanical problems will be introduced into the motor in an attempt to determine the effect on the coast-down curve. Author (GRA)

N76-27506# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
ANALYSIS OF ARBITRARILY ORIENTED THIN WIRE ANTENNA ARRAYS OVER IMPERFECT GROUND PLANES Interim Report
Tapan K. Sarkar and Bradley J. Strait Dec. 1975 106 p refs
(Contract F19628-73-C-0047; AF Proj. 5635)
(AD-A020991; SR-9; AFCRL-TR-75-0641) Avail: NTIS CSCL 09/5

The work considers the analysis of antenna and arrays of thin wires of arbitrary orientation above imperfectly conducting ground planes. Emphasis is placed on the development of fast and accurate techniques for computation of the characteristics of antenna systems. An important problem is the evaluation of certain semi-infinite integrals encountered in the exact Sommerfeld solution. The time required for computation of these integrals is reduced by the application of interpolatory quadrature formulas. Where applicable, a modified method of steepest descent is used to evaluate the integrals. The approximate reflection coefficient method is derived from the Sommerfeld formulation via the method of steepest descent. The accuracy of the reflection coefficient method relative to the Sommerfeld method is discussed. Finally, formulas convenient for the optimization of various performance indices are discussed. Typical indices that have been optimized, both with and without constraints, are directivity, power gain, quality factor, and main beam radiation efficiency. GRA

N76-27507# RCA Solid State Technology Center, Somerville, N.J.
RADIATION-HARD COS/MOS DEVICES INCORPORATING UNDOPED (DRY) SiO2 CHANNEL DIELECTRIC Interim Report
J. Fabula Jan. 1976 44 p
(DNA Proj. NWED-QAXTD033)
(AD-A020451; PRRL-75-CR-75) Avail: NTIS CSCL 09/5

The objective of this program is to define a 'dry oxide' process for the production of COS/MOS (CD4000 series) on bulk-silicon integrated circuits which simultaneously meets the demands of radiation hardness, producibility, and reliability. This process will use undoped (clean) SiO2 as the channel dielectric. During this study a matrix of silicon processing (6 runs of 10 wafers of the CD4023, and 6 runs of 10 wafers of the CD4049X) was completed. Seven of the runs completed under this matrix fit within the window of what will be the recommended 'Rad-Hard' pilot process. All seven of these runs exhibited radiation tolerance in excess of 1,000,000 rads total dose, with several runs operational past 3,000,000 rads. Devices so produced were tested too and found to meet both the commercial and the MIL-STD-883A 'hi-rel' specifications with good yields. Accelerated life testing was done on all twelve runs, and all exhibited excellent stability. GRA

N76-27508# General Electric Co., Syracuse, N.Y. Electronics Lab.
RELIABILITY STUDY OF MICROWAVE TRANSISTOR PACKAGING Final Technical Report
Donald J. LaCombe and Ronald J. Naster Griffiss AFB, N. Y. RADC Dec. 1975 172 p
(Contract F30602-74-C-0128; AF Proj. 5519)
(AD-A020739; RADC-Tr-75-292) Avail: NTIS CSCL 09/5

This report presents the results of a study to evaluate the influence of the package on the reliability of microwave power transistors. Emphasis in this study is placed on the effect of the package on the device reliability and not on the reliability of the package itself. This effort has consisted of a number of discrete study areas, which are related to each other only in that they all involve a different aspect of the reliability of the packaged device. They include a complex load plane study for the various available devices in which performance and junction temperature are defined over the complex load plane; a study of the sensitivity of the device to wire movement, a characterization of the integrity of the available carriers; and an epoxy seal evaluation. Several other related studies were carried out and are reported here. Author (GRA)

N76-27509# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
LOG-PERIODIC ANTENNAS: AN EXPERIMENTAL COMPARISON Instrumentation Papers.
Nicholas P. Kernweis 4 Nov. 1975 15 p refs
(AF Proj. 5635)
(AD-A020293; AFCRL-IP-240; AFCRL-TR-75-0577) Avail: NTIS CSCL 09/5

An experimental comparison of two designs of a 20-element log-periodic antenna is presented. During the experiment, the scaling constant (Tay) is held constant and the spacing constant (Sigma) varied. Author (GRA)

N76-27510# Air Weather Service, Washington, D.C.
THE 80 K UNCOOLED 7.25 - 7.75 GHZ PARAMETRIC AMPLIFIER

H. Levy Jan. 1976 87 p refs
(Contract DAAB07-72-C-0069)
(AD-A021106; AIL-5689-1) Avail: NTIS CSCL 09/5

The objective of this program (Contract DAAB07-72-C-0069) was to develop an uncooled parametric amplifier operating in the 7.25 to 7.75 GHz frequency band with an instantaneous bandwidth (1 dB) of 0.50 GHz that has a noise temperature of 80 K or less. The amplifier shall have a gain of approximately 30 dB and be suitable for field use in the AN/TSC-54 satellite communications medium terminal. GRA

N76-27511# General Electric Co., Schenectady, N.Y.
DESIGN, FABRICATION, AND EVALUATION OF AN ELECTRON BEAM ADDRESSABLE HIGH INFORMATION DENSITY MEMORY TUBE Interim Report, 1 Jun. - 30 Aug. 1975
Charles Q. Lemmond, W. C. Hughes, H. A. Gauper, Jr., George E. Posin, and James K. Fisher Jan. 1976 62 p
(Contract DAAB07-75-C-1312; DA Proj. 1S7-62705-AH-94D)
(AD-A020525; SRD-76-007; ECOM-75-1312-2; IR-2) Avail: NTIS CSCL 09/2

Radio-frequency interference tests were conducted to determine the tube's susceptibility to this form of interference. The tube performed without error for interference values within specification. A new electron gun with smaller beam spread was constructed and tested. Shielding improvements were made to the BEAMOS tube. Data were gathered on electronic interface equipment tolerances. Author (GRA)

N76-27270* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Engineering Section.
CONCEPTUAL STUDIES FOR NEW LOW-COST 64-m ANTENNAS
R. Levy *In its* The Deep Space Network 15 Jun. 1976 p 55-67 refs (For availability see N76-27262 18-12)
CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N76-27512 Northwestern Univ., Evanston, Ill.
STUDY OF CONTACT PROBLEMS WITH HEAT CONDUCTION OR IN CONNECTION WITH BEAM THEORIES Ph.D. Thesis
Carl Francis Panek 1975 90 p
Avail: Univ. Microfilms Order No. 76-12167

The use of Bernoulli-Euler, Timoshenko or Essenburg beam theories to study contact between a rigid indentor and an elastic beam is investigated. A specific test problem is chosen based on the ability to produce an elasticity solution for the beam; the more general problem of an elastic indentor acting on the elastic beam is actually solved. Contact pressure and total load are calculated for different extents of contact and a comparison between the three beam theories and the elasticity solution is made. The analysis takes into account beam thickness, consequently allowing evaluation of the results for slender or deep beams. The second part of this dissertation studies the interaction of the extent of contact, heat flow, and thermal strain for heat conduction between two solids. Dissert. Abstr.

N76-27513 Colorado State Univ., Fort Collins.
FINITE ELEMENT THERMO-MECHANICAL MODEL FOR CREEPING CONVECTION Ph.D. Thesis
Atuo Sato 1975 141 p
Avail: Univ. Microfilms Order No. 76-13660

The equations governing the flow of an incompressible, creeping viscous fluid coupled with the equations of heat transfer are solved using the finite element method. Primary application of this model is to the analyses of the earth's upper mantle. The nonlinear coupling occurs due to temperature and depth dependent viscosity, heat sources due to viscous dissipation, temperature dependent density and convective heat transfer. An iterative technique which yields fast convergence to a steady-state solution is reported. The coupled equations are formulated for both Eulerian and Lagrangian coordinate systems. Numerical results in both frames of reference have been obtained, and the advantages and disadvantages of the two formulations are discussed. A numerical technique to determine the shape of the free surface is developed which combines the best features of the Eulerian and Lagrangian formulations. Dissert. Abstr.

N76-27514 Illinois Inst. of Tech., Chicago.
DYNAMIC EFFECTS OF SURFACTANTS ON INTERFACIAL SHEAR FLOW BEHAVIOR Ph.D. Thesis
Manu K. Vora 1975 243 p
Avail: Univ. Microfilms Order No. 76-13157

An improved deep-channel viscous-traction viscometer was employed to investigate the dynamic effects of surfactants on the shear flow behavior at liquid-gas and liquid-liquid interfaces. It was revealed that an addition of surfactants resulted in shear and/or aging or structural dependent behavior. Mixed surfactant solutions consisted of sodium lauryl sulfate (commercial grade or purified by foam fractionation) and a fatty substance (lauryl alcohol, cetyl alcohol or lauric acid). At certain concentrations these systems showed an abrupt rise in the surface viscosity for a relatively small increase in the bulk concentration of sodium lauryl sulfate. It is conjectured that a molecular complex or phase transformation to a liquid crystalline phase takes place at the interface. This complex formation could then account for the increased hydrodynamic resistance in the form of surface viscosity. It was established that a purified sample of sodium lauryl sulfate in a mixed surfactant solution with lauryl alcohol tends to give a nearly Newtonian interface. Dissert. Abstr.

N76-27515* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF FORMING A WICK FOR A HEAT PIPE Patent
Frank G. Arcella (Westinghouse Electric Corp., Pittsburgh), Ernest C. Phillips, Jr. (Westinghouse Electric Corp., Pittsburgh), and Richard P. Sprecace, inventors (to NASA) (Westinghouse Electric Corp., Pittsburgh) Issued 22 Jun. 1976 4 p Filed 27 Feb. 1974 Supersedes N74-19584 (12 - 10, p 1233) Sponsored by NASA
(NASA-Case-NPO-13391-1; US-Patent-3,964,902;
US-Patent-Appl-SN-446567; US-Patent-Class-75-225;
US-Patent-Class-29-182; US-Patent-Class-29-193;
US-Patent-Class-55-523; US-Patent-Class-55-526;
US-Patent-Class-165-105) Avail: US Patent Office CSCL 20D

A method of forming a tubular wick for a heat pipe is presented. The method is characterized by the steps of forming a wick blank of a predetermined thickness comprising a plurality of superimposed layers of stainless steel mesh screen, wet rolling the blank for reducing the thickness, wrapping the blank about an inner mandrel, compressing the blank into a rigid tubular structure, removing the tubular structure from the mandrel and sintering the tubular structure.
Official Gazette of the U.S. Patent Office

N76-27516*+ New Mexico Univ., Albuquerque. Technology Application Center.
HEAT PIPE TECHNOLOGY. A BIBLIOGRAPHY WITH ABSTRACTS Quarterly Update, 31 Dec. 1975
31 Dec. 1975 53 p Sponsored by NASA
(NASA-CR-148320) Copyright. Avail: NTIS for foreign requesters only. Domestic orders, Univ. of New Mexico, Tech. Application Center, Albuquerque CSCL 20M

Heat Pipe Technology is a continuing bibliographic summary of research on the subject of the heat pipe. This update to Heat Pipe Technology cites the additional references identified during October, November and December of 1975. A library containing essentially all of the articles and publications referenced in this update, and all the previous volumes has been established. Author

N76-27517* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SYSTEM FOR MEASURING REYNOLDS IN A TURBULENTLY FLOWING FLUID Patent

Dah Yu Cheng, inventor (to NASA) (Santa Clara Univ., Calif.) Issued 22 Jun. 1976 9 p Filed 29 Jan. 1975 Supersedes N75-16770 (13-08, p 0881) Continuation-in-part of abandoned US Patent Appl. SN-424013, filed 12 Dec. 1973 Sponsored by NASA

(NASA-Case-ARC-10755-2; US-Patent-3,964,306; US-Patent-Appl-SN-545284; US-Patent-Class-73-194R; US-Patent-Class-73-147; US-Patent-Class-73-189; US-Patent-Appl-SN-424013) Avail: US Patent Office CSCL 20D

A system for measuring momentum flux in a turbulently flowing fluid includes: a sensing apparatus for dynamically sensing the mainstream and the cross velocity components of the fluid, a transducer operative to provide two electrical output signals representative of the velocity components in the mainstream and in the cross direction, and signal processors to derive the Reynolds stress wave and the Reynolds stress.

Official Gazette of the U.S. Patent Office

N76-27518*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW VISUALIZATION IN LONG NECK HELMHOLTZ RESONATORS WITH GRAZING FLOW

Kenneth J. Baumeister and Edward J. Rice 1976 9 p refs Presented at the 3rd Aero-Acoustics Conf., Palo Alto, Calif., 20-23 Jan. 1976; sponsored by AIAA

(NASA-TM-X-73400; E-8723) Avail: NTIS HC $3.50 CSCL 20D

Both oscillating and steady flows were applied to a single plexiglass resonator cavity with colored dyes injected in both the orifice and grazing flow field to record the motion of the fluid. For oscillatory flow, the instantaneous dye streamlines were similar for both the short and long-neck orifices. The orifice flow blockage appears to be independent of orifice length for a fixed amplitude of flow oscillation and magnitude of the grazing flow. The steady flow dye studies showed that the acoustic and steady flow resistances do not necessarily correspond for long neck orifices. Author

N76-27519# Politecnico di Milano (Italy).

APPROXIMATE SOLUTION OF THE VON MISES BOUNDARY-LAYER EQUATION

Adolfo Reggiori 9 Apr. 1976 30 p refs Backup Document for AIAA Synoptic scheduled for publication in AIAA Journal., Nov. 1976

Avail: NTIS HC $4.00

This work deals with the problem of computing the laminar boundary layer along a wall downstream of arbitrary initial velocity profiles. The nonlinear term in the Von Mises equation is replaced with a suitable effective velocity in the spirit of the Oseen approximation; introducing then an auxiliary variable (a stretching of the streamwise coordinate x), the well known heat conduction equation with constant coefficients is obtained; this equation can be easily solved in closed form and in particular the shearing stress on the wall is obtained as a function of the auxiliary variable. The relationship between the auxiliary variable and the physical coordinate is then determined for the case of similar profiles by comparison with the known exact solutions of the Falkner-Skan equation; this relationship does not depend explicitly on the initial conditions, but only on the pressure gradient parameter and on the local values of the shearing stress. Author

N76-27520# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.

INVESTIGATIONS OF TWO PACKED FIBER INSULATIONS IN A HORIZONTAL PRESSURE TUBE

P. Broeckerhoff Oct. 1975 105 p refs In GERMAN

(Jul-1241) Avail: ERDA Depository Libraries HC $5.50

A fiber insulation material was tested in a horizontal pressure tube of a high pressure gas tunnel. Pressure and temperature of the test gases air helium were up to about 40 bar and 400 C. Temperatures and heat fluxes in the different sectors indicated satisfactory results. Natural convection, which would have caused a modification of the insulation, appeared to be only weak. Fiber densities of 280 kg/cu meter and 400 kg/cu meter respectively prevented gas movements, though the cohering gas volume in the insulation was rather big. Pressure gradients caused by the flowing gas did not influence the insulation effect. Author (NSA)

N76-27521# Los Alamos Scientific Lab., N.Mex.

NUMERICAL METHOD FOR STUDYING THE CIRCULATION PATTERNS OF A FLUID IN A CAVITY

L. M. Stephani and T. D. Butler Oct. 1975 40 p

(Contract W-7405-eng-36)

(LA-6014) Avail: NTIS HC $4.00

The method incorporates three circulation-inducing mechanisms: (1) buoyancy induced by nonuniform initial distribution of heat throughout the fluid, (2) buoyancy induced by removal of heat from the fluid, and (3) forced convection induced by withdrawal of heated fluid and return of cooled fluid. A two-dimensional computer program, CIRCO, based on the Marker-and-Cell (MAC) technique, is used to study the circulation patterns. The code and its capabilities are described by means of examples from studies conducted for the Pacer project, which investigates the concept of producing electrical power from energy released by thermonuclear explosions in a salt dome. Efficient engineering for withdrawing energy from the cavity requires an understanding of the circulation patterns of the heated fluid. The program provides this information in the form of computer-generated plots. Author (NSA)

N76-27522# Sandia Labs., Livermore, Calif.

ROUGH WALL TURBULENT HEAT TRANSFER WITH VARIABLE VELOCITY, WALL TEMPERATURE, AND BLOWING

H. W. Coleman, M. M. Pimenta (SAO Paulo Univ. Brazil), and R. J. Moffat Nov. 1975 10 p refs Presented at the 14th AIAA Aerospace Sci. Meeting, Washington, D. C., 26 Jan. 1976

(Contract AT(29-1)-789)

(SAND-75-8733; Conf-760102-2) Avail: NTIS HC $4.50

An integral prediction method is presented which accurately describes Stanton number behavior for a fully rough turbulent boundary layer flowing over a uniformly rough surface. The kernel function which represents the response of such a system to an unheated starting length is shown to also describe the response to variations in freestream velocity, surface temperature and blowing. Predictions are compared with experimental data for cases of variable wall temperature, favorable pressure gradients and variable blowing. Agreement is excellent in all cases.

Author (ERA)

N76-27523# Sandia Labs., Albuquerque, N.Mex.

APPLICATION OF MULTIBEAM LASER VELOCIMETRY TO GAS FLOW MEASUREMENTS

C. E. Hackett 1975 22 p refs Presented at the Laser Anemonetry Symp., Minneapolis, Minnesota, 22 Oct. 1975 Sponsored in part by ERDA and Air Force Systems Command

(SAND-75-5462) Avail: NTIS HC $4.50

The theory and design considerations for both real and virtual multibeam laser velocimetry systems have been developed for application to gas flow measurements inside a chemical laser device. The advantages of multibeam laser velocimetry are discussed in comparison with existing systems. The design features of a spatially scanning virtual multibeam wavelength tunable laser velocimeter system for use on an actual chemical laser device are described. The computer interfacing and serial multiplexing schemes for three dimensional velocimetry are discussed.

Author (ERA)

N76-27524# Rome Univ. (Italy). Inst. of Aeronautical Constructions.

SOLUTIONS OF HEAT CONDUCTION PROBLEMS WITH RADIATIVE BOUNDARY CONDITIONS ON A CONTINUOUS SCHEME. PART 1: THEORY AND EQUATIONS

Carlo Arduini, Silvano Gubini, and Carlo Ulivieri Apr. 1974 23 p refs

(Rept-43) Avail: NTIS HC $3.50

The radiative boundary condition in a heat conduction problem relates the heat flux in a point of the wall to the temperatures in all the other points of the surface system. This condition is of a functional type. This functional can be resolved in discrete terms by using the conventional technique of dividing the body

in small discrete elements or nodes. Instead, an approach of a continuous scheme is presented by which the functional is resolved in terms of spacewise harmonics of the temperature inside the body; the heat conduction problem is thus reduced to an ordinary form of differential system whose unknowns are these harmonics. An iterative linearized procedure to solve this system is also suggested, by which exact solutions are obtained. The merits of these solutions with respect to practical discrete elements computations are in the better spacewise resolution and in the consequently more accurate treatment of both radiation and conduction. The application of the procedure is, however, limited to particular geometries. Author (ESA)

N76-27525# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

INTERACTIONS BETWEEN TURBULENT BOUNDARY LAYERS AND FLEXIBLE WALLS [WECHSELWIRKUNGEN ZWISCHEN TURBULENTEN WANDGRENZSCHICHTEN UND FLEXIBLEN WAENDEN]

G. Zimmermann Nov. 1974 55 p refs In GERMAN
(Rept-10/1974) Avail: NTIS HC $4.50; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 15,25

The influence of a flat flexible wall on a fully developed turbulent boundary layer flow along this wall is discussed theoretically. For simplification, this influence is represented by a small perturbation of a turbulent boundary layer flow along a solid wall. The linear problem for the perturbation flow is transferred to an integral equation, which is treated by an approximation. A rough estimation, using also experimental results, indicates that the flexible wall causes drag reduction. In air this reduction is one or two promille, whereas in water the reduction is in the order of magnitude of 5 to 10%. ESA

N76-27526# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

EFFECT OF SUCTION ON FULLY DEVELOPED TURBULENT PIPE FLOW

Manfred Schildknecht Jul. 1975 92 p refs In GERMAN; ENGLISH summary
(Rept-3/1975) Avail: NTIS HC $5.00

The influence of suction on a turbulent pipe flow, especially on regions near the wall, was experimentally investigated. Provision was made for suction in a fully developed turbulent pipe flow with Reynolds number Re = 17,250. The duct wall was perforated. Different amounts of fluid were uniformly sucked away around the perimeter. The various terms in the turbulent energy balance were evaluated over the entire cross section at four different axial positions in this duct for one suction rate. The principal results are: the amplitudes of the three velocity-fluctuation components are reduced by suction in different amounts, and the suction-induced change in the state of turbulence travels with approximately the wall friction velocity from the wall toward the center of pipe; even by removing small amounts of fluid, the maximum values of the turbulent energy balance terms, occurring near the wall, are strongly reduced. The positions of the maxima are not shifted toward the wall. Author (ESA)

N76-27527# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

SUPERSONIC FREE JETS WITH HEATED MANTLE JET

W. J. Hiller, A. Dinkelacker, W. Kraemer, and G. E. A. Meier Aug. 1975 23 p refs In GERMAN; ENGLISH summary Prepared jointly with Messer Griesheim GmbH
(Rept-7/1975) Avail: NTIS HC $3.50; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 12,25

The fluid-dynamic qualities of supersonic jets change considerably if these jets are surrounded by coaxial high temperature jets. Especially remarkable is an increase in the length of the supersonic jet and a frequency shift in the radiated noise. Increases of the length of the supersonic jet up to a factor of 20 have been observed. Optical and acoustical measurements on such jets, for which commercially available cutting torches have been used as nozzles, are reported. Author (ESA)

N76-27528# European Space Agency, Paris (France).

INVESTIGATION OF THE THREE-DIMENSIONAL FLOW IN A DUCT WITH QUADRANGULAR, VARIABLE CROSS SECTION BY MEANS OF THE PANEL METHOD

Juergen Renken Feb. 1976 52 p refs Transl. into ENGLISH of 'Untersuch. der dreidimensionalen Stroemung in einem Kanal mit rechteckigem, variablem Querschnitt mit Hilfe des Panel-Verfahrens', DFVLR, Cologne Report DLR-FB-75-46, 18 Jun. 1975 Original German report available from DFVLR, Cologne DM 21,50
(ESA-TT-253; DLR-FB-75-46) Avail: NTIS HC $4.50

The applicability of the panel method for calculating the three-dimensional flow in ducts with quadrangular, variable cross section such as straight cascades is investigated in an attempt to determine the influence of the side wall contraction on the flow. The theoretical results are compared with qualitative data obtained in an equivalent water flow. Author (ESA)

N76-27529# Wisconsin Univ., Madison. Mathematics Research Center.

THE CROCCO-TRANSFORMATION FOR THE THREE-DIMENSIONAL PRANDTL BOUNDARY LAYER EQUATIONS Technical Summary Report

Karl Nickel Nov. 1975 17 p refs
(Contract DAAG29-75-C-0024)
(AD-A020215; MRC-TSR-1594) Avail: NTIS CSCL 20/4

The three-dimensional fluid flow of a steady or unsteady moving incompressible continuous medium is considered. Several Crocco-type transformations are applied which reduce the system of three equations of the Prandtl boundary layer to a system of two strongly coupled parabolic equations. GRA

N76-27530# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Guidance and Control Directorate.

EVALUATION OF THE GARRETT/AIRESEARCH ELECTRO-FLUIDIC TRANSDUCER

James G. Williams Aug. 1975 34 p
(AD-A020469; RG-76-14) Avail: NTIS CSCL 20/4

Two electrofluidic interfaces, manufactured by Garrett Corporation-AiResearch, were statically and dynamically evaluated to determine their characteristics. One interface unit was modified by adding Ferrofluid to increase dampening. The data, conclusions, and recommendations were presented for both interface units. Author (GRA)

N76-27531# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE STABILITY OF SOLITARY WAVES

James G. Berryman Oct. 1975 28 p refs
(Contract DAAG29-75-C-0024; Grant NSF ENG-75-08492)
(AD-A020216; MRC-TSR-1598) Avail: NTIS CSCL 20/4

The Korteweg-de Vries soliton is shown to be stable whereas the Boussinesq soliton is shown to be unstable to infinitesimal perturbations. A method is demonstrated for finding eigensolutions of the perturbation equation in both cases. GRA

N76-27532# California Univ., Berkeley. Dept. of Mechanical Engineering.

DIRECTED FLUID SHEETS

A. E. Green (Mathematical Inst., Oxford) and P. M. Naghdi Jan. 1976 57 p refs
(Contract N00014-76-C-0474; NR Proj. 062-534)
(AD-A020350; AM-76-1) Avail: NTIS CSCL 20/4

This paper is concerned mainly with incompressible inviscid fluid sheets but the incompressible linearly viscous fluid sheet is also considered. The development is based on a direct formulation using the two-dimensional theory of directed media called Cosserat surfaces. The first part of the paper deals with the formulation of appropriate nonlinear equations which may include the effects of gravity and surface tension, governing the two-dimensional motion of incompressible inviscid media for two categories, namely, (1) for two-dimensional flows confined to a plane perpendicular to a specified direction and (2) for propagation of fairly long waves in a stream of variable initial depth. The latter development is a generalization of an earlier direct formulation of a theory of water waves when the fixed bottom of the stream is level (Green, Laws and Naghdi, 1974). Special attention is given to a demonstration of the relevance and applicability of

the present direct formulation to a variety of two-dimensional problems of inviscid fluid sheets. GRA

N76-27533# Cincinnati Univ., Ohio. Dept. of Chemical and Nuclear Engineering.
EVALUATION OF PRESSURE DROP ACROSS AREA CHANGES DURING BLOWDOWN Quarterly Progress Report, 1 Oct. - 31 Dec. 1975
J. Weisman Feb. 1976 14 p refs
(Contracts AT(49-24)-0179; E(11-1)-2152)
(PB-249926/7; NUREG-0047-1) Avail: NTIS HC $3.50 CSCL 18I

Transient pressure drops across abrupt area changes are determined in a series of blowdown experiments. These tests are conducted, with Freon 113 as the test fluid, in a well instrumented apparatus. Only preliminary blowdown runs were possible. The preliminary runs indicated the revised loop configuration to be generally satisfactory. The apparatus is now being revised to remedy hardware failures and to add some additional instrumentation. A finite difference procedure was developed and the computer program largely completed. A parallel effort, using the method of characteristics, shows real characteristics for the conditions examined. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N76-27534*# Unitech, Inc., Austin, Tex.
BALLISTIC SIGNATURE IDENTIFICATION SYSTEM STUDY Final Report
12 May 1976 40 p refs
(Contract NAS9-14708)
(NASA-CR-147820; UNITECH-76-020-U) Avail: NTIS HC $4.00 CSCL 14E

The first phase of a research project directed toward development of a high speed automatic process to be used to match gun barrel signatures imparted to fired bullets was documented. An optical projection technique has been devised to produce and photograph a planar image of the entire signature, and the phototransparency produced is subjected to analysis using digital Fourier transform techniques. The success of this approach appears to be limited primarily by the accuracy of the photographic step since no significant processing limitations have been encountered. Author

N76-27535*# Scientific Translation Service, Santa Barbara, Calif.
LITTLE THINGS
Eric Dyring Washington NASA Jun. 1976 7 p Transl. into ENGLISH from Forskning och Framsteg (Sweden), no. 3, 1976 p 53-56
(Contract NASw-2791)
(NASA-TT-F-17092) Avail: NTIS HC $3.50 CSCL 14E

This is a brief discussion of advances in photographic techniques derived from the U.S. space programs. Author

N76-27536*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
HIGHLY SENSITIVE INSTRUMENT FOR MEASURING SMALL GAS PRESSURES
B. V. Zubkov, A. V. Sermyagin, S. V. Umanskiy, and V. N. Khromov Washington NASA Jul. 1976 25 p refs Transl. into ENGLISH of "Vysokochuvstvitelnyy Pribor dlya Izmereniya Malykh Davleniy Gazov", Rept. Pr-239 Inst. of Space Res., Acad. Sci. USSR, Moscow, 1975 25 p
(Contract NASw-2789)
(NASA-TT-F-17049; Pr-239) Avail: NTIS HC $3.50 CSCL 14B

The principles for operation and design of an instrument, manufactured for measuring small pressures of a dispersing target is described. The principle of the instrument's operation is based on the time measurement of the discharge of a strictly specified portion of gas being measured under conditions of an established free molecular flow in a collision chamber. The instrument provides for measuring small consumptions of gas with an absolute error not exceeding 1%. Author

N76-27537*# Nebraska Univ., Lincoln. Behlen Lab. of Physics.
A CALIBRATION OF DETECTORS AND GRATINGS BETWEEN 100 AND 600 ANGSTROMS Final Report, Nov. 1972 - Dec. 1975
James A. R. Samson Dec. 1975 87 p refs
(Contract NAS5-23125)
(NASA-CR-144777) Avail: NTIS HC $5.00 CSCL 14B

Calibration and efficiency measurements of magnetic electron multipliers, diffraction gratings, and photocathodes over the wavelength range 100 to 600 A are reported. For some of the measurements it was found necessary to use the synchrotron radiation from a storage ring. Measurements of grating efficiencies, the polarization produced by diffraction gratings, and the photoelectric yields of various photocathodes are included. B.B.

N76-27538*# McDonnell-Douglas Astronautics Co., St. Louis, Mo. Dept. of Advanced Space Avionics.
THE 1.06 MICROMETER WIDEBAND LASER MODULATOR: FABRICATION AND LIFE TESTING Final Report, 25 Jul. 1974 - 25 Jul. 1975
J. R. Teague Sep. 1975 172 p
(Contract NAS5-20605)
(NASA-CR-144783) Avail: NTIS HC $6.75 CSCL 14B

The design, fabrication, testing and delivery of an optical modulator which will operate with a mode-locked Nd:YAG laser at 1.06 micrometers were performed. The system transfers data at a nominal rate of 400 Mbps. This wideband laser modulator can transmit either Pulse Gated Binary Modulation (PGBM) or Pulse Polarization Binary Modulation (PPBM) formats. The laser beam enters the modulator and passes through both crystals; approximately 1% of the transmitted beam is split from the main beam and analyzed for the AEC signal; the remaining part of the beam exits the modulator. The delivered modulator when initially aligned and integrated with laser and electronics performed very well. The optical transmission was 69.5%. The static extinction ratio was 69:1. A 1000 hour life test was conducted with the delivered modulator. A 63 bit pseudorandom code signal was used as a driver input. At the conclusion of the life test the modulator optical transmission was 71.5% and the static extinction ratio 65:1. Author

N76-27539*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
WIDEBAND 1.064 MICROMETER DETECTOR EVALUATION Final Report
S. I. Green Sep. 1975 151 p
(Contract NAS5-20616)
(NASA-CR-144784) Avail: NTIS HC $6.75 CSCL 14B

The performance of several candidate detectors for use as communications detectors in a 400 Mbps 1.064 micrometers laser communication system was evaluated. The results of communication system Bit Error Rate (BER) testing for the best detector of each type are summarized. Complete testing data of each type detector is presented. The 400 Mbps 1.064 micrometers communication system receiver test bed is described. The best communication system results for each detector type are included. Performance comparisons are made at 0.000001 BER, the specification level chosen for satellite laser communication links. The data is presented in two groups. The first indicates the best performance levels that can be expected on normal space laser communication system operation. The second cites the best performance levels which can be achieved by focusing the signal to diffraction limited spots on the photosensitive area. B.B.

N76-27540# Joint Inst. for Nuclear Research, Dubna (USSR).
HIGH VOLTAGE CONTROL OF PHOTOMULTIPLIERS
D. Kollar, L. Kollarova, and P. Horvath 1975 8 p refs In RUSSIAN
(JINR-P13-9028) Avail: ERDA Depository Libraries HC $4.50

Digitally controlled CAMAC module for automatic measure-

ment of EHT characteristic of photomultipliers and for stability of gain control of the spectrometric channels with photomultipliers is described. Author (NSA)

N76-27541# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemical Engineering.
PRESENT STATUS OF AUTOMATIC ELLIPSOMETERS
R. H. Muller Sep. 1975 33 p refs Presented at the 3rd Intern. Conf. on Ellipsometry, Lincoln, Nebraska, 23-25 Sep. 1975
(Contract W-7405-eng-48)
(LBL-3930; Conf-750993-2) Avail: NTIS HC $5.00

Operating principles and capabilities of presently-built automatic ellipsometers are reviewed. The instruments are classified according to their optical principles of operation and their capabilities are compared on the basis of uniform performance criteria. Possible future developments are indicated. Author (ERA)

N76-27542# Institut Franco-Allemand de Recherches, St. Louis (France).
DETERMINATION OF TIME DEPENDENT SIZE DISTRIBUTIONS OF FOG DROPLETS USING LASER SCATTERING [BESTIMMUNG ZEITLICH VERAENDERLICHER GROESSENVERTEILUNGEN VON NEBELTROEPFCHEN MITTELS LASERSTREUUNG]
H. Mach, U. Werner, H. Masur, and R. Hunkler 7 May 1974 51 p refs In GERMAN
(ISL-17/74) Avail: NTIS HC $4.50

A method for measuring drop size distributions in fog using lasers is described. The forward scattering of light on aerosol particles, especially fog particles, resembles a Fraunhofer refraction if the scattering angle theta is less than 8 deg and the Mie parameter alpha greater than 10. The relative scattering intensity is calculated as function of theta, alpha, and 3 parameters of the gamma function describing the drop distribution having one maximum. The intensity can be so represented that it can be compared with the measurable angular distribution. A method to determine the distribution parameters results from this. Extinction measurement leads to indications for a number of particles and mass concentration. The method was tested using a test hydrosol and used to measure growing fog droplets in a fog expansion chamber with laser irradiation. A special optical waveguide system was used to obtain a higher time resolution. ESA

N76-27543# Institut Franco-Allemand de Recherches, St. Louis (France).
METHOD FOR IMPROVEMENT OF DATA EVALUATION IN LASER ANEMOMETRY [EIN VERFAHREN ZUR VERBESSERUNG DER DATENAUSWERTUNG IN DER LASERANEMOMETRIE]
H. J. Pfeifer 27 Aug. 1974 22 p refs In GERMAN
(ISL-31/74) Avail: NTIS HC $3.50

A method is described allowing improvement of the accuracy of the measurement results or an increase in the number of signals to be processed for laser anemometry, at the same signal to noise ratio. The double counter method, which is used in laser anemometry for obtaining high accuracy in data evaluation, is outlined. The basis of the improvement to this method is a time delay between the activation of the counters and the measuring signal, obtained by means of a delay line. ESA

N76-27544# Institut Franco-Allemand de Recherches, St. Louis (France).
SIZE DISTRIBUTIONS OF ATOMIZED SILICONE OIL [GROESSENVERTEILUNGEN VON ZERSTAEUBTEM SILIKONOEL]
H. W. Koch and I. Bischoff 29 Aug. 1974 23 p refs In GERMAN
(ISL-33/74) Avail: NTIS HC $3.50

The size distributions of drops captured from silicone oil aerosols were determined for various aerosol production methods. Whisker nets were used as catchers, and an electron microscope for observation thereof. The size distributions were determined from the particle images. These lie between 0.2 and 7 micron, as a function of the production method. The effect of atomizing pressure on the size of formed particles is small, particle size decreasing with increasing pressure. An important difference was remarked for various atomizers. Slight nozzle diameter variations affect the drop size. A breaker plate in part of the nozzle prevents the formation of particles larger than 3 micron. The possible underestimation of the smallest particles by this method is discussed. ESA

N76-27545# Institut Franco-Allemand de Recherches, St. Louis (France).
THREE DIMENSIONAL VISUALIZATION BY HIGH SPEED HOLOGRAPHY OF A PROJECTILE WAKE LAUNCHED AT MACH 2 [VISUALISATION PAR HOLOGRAPHIE ULTRARAPIDE DU RELIEF D'UN SILLAGE DE PROJECTILE EN VOL A MACH 2]
H. Fagot, P. Smigielski, and G. Simon 20 Aug. 1974 9 p refs In FRENCH Presented at the 11th Congr. Intern. de Phot. Ultrarapide, London, 16-20 Sep. 1974
(ISL-CO-17/74) Avail: NTIS HC $3.50

Holography in diffuse light was used successfully for the three-dimensional visualization of the turbulent wake of a tracer bullet (30 mm diameter) launched in a ballistic range at a velocity of 730 m/s. Two holograms (18 cm x 24 cm) were recorded simultaneously in two different directions (60 deg) with the aid of a single mode ruby laser (20 ns, 150 mJ giant pulse). Each hologram covered a viewing angle of the order of 15 deg. The method presented allows fundamental investigations of the spatial configuration of turbulences. Author (ESA)

N76-27546# Royal Netherlands Meteorological Inst., De Bilt.
CALIBRATION AND MODERNIZATION OF 160 m BASIS TRANSMISSOMETERS [IJKING EN MODERNISERING VAN 160 m BASIS TRANSMISSOMETERS]
F. Cannemeijer and M. P. D. Jansse 1976 22 p refs In DUTCH
(KNMI-V-271) Avail: NTIS HC $3.50

In view of the introduction of 16 m basis transmissometers at Schiphol airport, the Netherlands, the existing 160 m basis transmissometers were calibrated. The wavelength dependence of filters, detector, and lamp are discussed, and calibration by means of periodically interrupting the light beam is dealt with. The functioning principle of the 160 m basis transmissometer, notably of the old photodetector used, is presented, and details of the new photoelectric detector to be introduced (Pin-10DP, United Detector Technology Inc.) are given. Measurements of the new detector, with periodical beam interruption and using a grey filter, are discussed. The advantages of the new detector are summarized. ESA

N76-27547# Centre National d'Etudes Spatiales, Toulouse (France).
DEVICE FOR MEASURING DIRECTLY HYDRAZINE LEAKAGE IN VALVES [DISPOSITIF DE MESURE DIRECTE DE LA FUITE HYDRAZINE DES CLAPETS DE VANNE]
Roland Salome Feb. 1976 17 p refs In FRENCH; ENGLISH summary
(CNES-NT-27) Avail: NTIS HC $3.50

Hydrazine leakage from a valve was measured directly using a method based on the compressibility of hydrazine. The hydrazine was pressurized in a volume of which one plane is a deformable membrane. The hydrazine loss creates a deformation of this membrane, which was measured. A preliminary calibration was used to relate this deformation to the lost hydrazine quantity. A particular effort was made to obtain the best tightness of the device and to increase its temperature sensitivity. ESA

N76-27548# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
OPTIMIZATION OF TELESCOPE CONFIGURATIONS FOR SATELLITE ANISOTROPY MEASUREMENTS
T. R. Sanderson and R. J. Hynds (Imperial Coll. of Sci. and Technol.) 1975 5 p refs Presented at the 14th Intern. Cosmic Ray Conf., Munich, 15-29 Aug. 1975
Avail: NTIS HC $3.50

Anisotropy measurements of low energy solar particles are usually made by a single detector mounted perpendicularly to the axis of a spinning satellite. This gives a 2-dimensional picture of the spatial distribution. A simulation study is described which studies the optimization of a set of 3 telescopes,

with a view to obtaining the full 3-dimensional distribution. Some of the results are illustrated by considering an isotropic power law distribution of low energy solar protons convecting with the solar wind. Author (ESA)

N76-27549# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
A SEALED XENON GAS SCINTILLATION PROPORTIONAL COUNTER FOR X-RAY ASTRONOMY
R. D. Andresen, L. Karlsson, and B. G. Taylor 1975 5 p refs Presented at the Nucl. Sci. Symp., San Francisco, 18-21 Nov. 1975
Avail: NTIS HC $3.50

A gas scintillation proportional counter operating without the conventional gas purification system, for use in instruments for X-ray astronomy, is under development. A parallel grid detector was built employing ultra high vacuum technology, equipped with a caesium getter to maintain purity, filled with xenon at one atmosphere and sealed. The detector does not employ a wavelength shifter (the scintillation being in the UV region) and no attention was paid to optimizing the light collection efficiency. The experimental results demonstrate that the output signal is in the form of a pulse-train, which offers unforeseen possibilities for direct digital energy measurements, involving high frequency pulse counting and pulse-train length discrimination for the vetoing of particles producing extended ionization trails. Author (ESA)

N76-27550# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
A GAS SCINTILLATION PROPORTIONAL COUNTER FOR X-RAY ASTRONOMY
R. D. Andresen, B. G. Taylor, and P. Sanford (Mullard Space Sci. Lab.) 1975 4 p ref Presented at the 14th Intern. Cosmic Ray Conf., Munich, 15-29 Aug. 1975
Avail: NTIS HC $3.50

A transparent parallel plate xenon gas scintillation proportional counter was designed and built using ultra-high vacuum technology. This X-ray detector should achieve improved resolution by eliminating the charge multiplication stage. In order to use such a detector for space research it is highly desirable to eliminate any gas flow purification system. A new concept was therefore developed which uses a Ce-getter and does not depend on the presence of wavelength shifters. The preliminary experimental results, which are comparable to that achieved with an ordinary wire gas counter, demonstrate that this new concept is feasible. With a better light collecting geometry, which was deliberately not optimized in this first prototype, significant improvement is possible. Author (ESA)

N76-27551# European Space Research and Technology Center, Noordwijk (Netherlands).
DEVELOPMENT OF AN IMAGE STORAGE TUBE
H. Samuelsson 1975 13 p refs Presented at the 5eme Journees d'Opt. Spatiales, Marseille, 14-17 Oct. 1975
Avail: NTIS HC $3.50

A demand for a sensitive camera tube with high resolution was identified as a result of various feasibility studies for future scientific satellite missions. After some initial studies it was concluded that the SEC (Secondary Electron Conduction) target would best meet the requirements. The development work carried out was based on a standard SEC tube. By introducing various modifications the tube performance was improved as regards resolution, integration time, and resistance against vibrations. Applications are envisaged in scientific instruments and as a star field camera for attitude acquisition. Author (ESA)

N76-27552# European Space Research and Technology Center, Noordwijk (Netherlands).
THE COS-B EXPERIMENT PROGRAMME
B. G. Taylor 1975 13 p Presented at the Intern. Conf. on Technol. of Sci. Space Expt., Paris, 26-30 May 1975
Avail: NTIS HC $3.50

The COS-B satellite's mission is discussed. This satellite carries a single large experiment capable of detecting gamma rays with energies in excess of 30 MeV in order to study in detail the sources of extraterrestrial gamma radiation. The gamma ray telescope has been produced by a collaboration of six research laboratories. Steps in the development program are reviewed. The software for post-launch analysis has been produced and tested using data from the beam calibrations and balloon flight. The setup for data reduction is described. ESA

N76-27553# European Space Agency, Paris (France).
THE FIRST SPACELAB PAYLOAD
M. J. Collet 1975 15 p In FRENCH; ENGLISH summary Presented at the CNES/ESRO Symp. on Technol. of Space Expts., Paris, 26-30 May 1975
Avail: NTIS HC $3.50

Technical constraints specific to the first Spacelab mission are described, and the joint experiment objectives determined between ESA and NASA are explained. A working group was formed by ESA to determine the first payload. ESA

N76-27554# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
THE CONE PENETROMETER FOR FOUNDATION DESIGN INVESTIGATIONS
P. David Smith Nov. 1975 33 p refs Prepared in cooperation with Federal Highway Admin., Washington, D. C.
(PB-249689/1; NYSDOT-ERD-75-RR-33) Avail: NTIS HC $4.00 CSCL 14B

The Dutch cone penetrometer is gradually being accepted by American engineers as a supplemental in-situ soil investigation device. Its development in the late 1930's by European engineers was followed by widespread use in European countries having soil conditions suitable to cone penetration testing -- clays silts, sands (< 50 SPT), and gravel (< 10 percent of 1-in. effective diameter). Some major uses are the following: (1) to identify soil types and establish profiles, (2) to predict bearing capacity and friction resistance of piles, (3) to predict soil settlement, (4) to determine the relative density of cohesionless soils, and (5) to predict in-situ shear strength of cohesive soil. Based on the research reported, it appears highly probable that the test would be useful and beneficial to New York's soils exploration program by (1) predicting certain soil engineering parameters more accurately, and (2) increasing the productivity of field investigations. GRA

N76-27272* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Elements Research Section.
DEVELOPMENT OF A WATER VAPOR RADIOMETER TO CORRECT FOR TROPOSPHERIC RANGE DELAY IN DSN APPLICATIONS
P. D. Batelaan, T. Sato, S. D. Slobin, and H. Reilly *In its* The Deep Space Network 15 Jun. 1976 p 77-84 refs (For availability see N76-27262 18-12)
CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N76-27555# Polish Academy of Sciences, Warsaw.
A SIMPLIFIED MODEL OF A HIGH PRESSURE CO2-N2 LASER PUMPED BY A DISCHARGE CONTROLLED BY A BEAM OF ELECTRONS [UPROSZCZONY MODEL WYSOKOCISNIENIOWEGO LASERA CO2-N2 POMPOWANEGO WYLADOWANIEM STEROWANYM WIAZKA ELEKTRONOW]
Wojciech W. Byszewski 4 Oct. 1975 43 p refs In POLISH
Avail: NTIS HC $4.00

A three-level model of the CO2-NO2 molecular structure is employed; relaxation of energy associated with the pressure of water steam is considered. It is established that the increase of pressure of the compound up to ten atmospheres does not induce new processes as compared with low pressure lasers, and speeds of processes with respect to one molecule do not change. Solutions of a five equation system, to which the model is reduced, are compared with experimental results. Good qualitative and quantitative agreement is attained after disregarding the adhesion process and the triple increase of the recombination factor. The model clarifies many aspects of laser physics and can be used to optimize work conditions in the pressure range of one to ten atmospheres. Author

N76-27556# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.

MODE STUDY, BEAM CHARACTERISTICS OF A 100 mW cw 337 MUm HCN WAVEGUIDE LASER

P. Belland, D. Veron, and L. B. Whitbourn May 1975 27 p refs

(EUR-CEA-FC-772) Avail: ERDA Depository Libraries HC $4.00

The first continuous sub-millimeter waveguide laser operating on the 337 micron HCN line is described. Results of the first comprehensive experimental study of its low-loss modes are presented. The laser cavity is a 5 cm dia, 2.4 m long pyrex tube with plane reflectors (one of them is a metal mesh) against its ends. Eight modes were identified. Intensity distributions in the beam cross section and mode polarization were studied. The results agree with theoretical predictions for dielectric waveguide modes. The propagation of the EH sub 11 mode in free space was also studied. The beam propagates as a Gaussian beam at moderate, and large distances from the mesh coupler. The maximum output power of the laser is of the order of 100 mW representing the highest output power unit volume so far reported for a continuous HCN laser. Author (NSA)

N76-27557# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

FLOW WITH VIBRATIONAL ENERGY EXCHANGE, APPLICATION TO CO2 ELECTRIC LASER

C. Dahan 1974 82 p refs In FRENCH

(ONERA-NT-216) Available on microfiche at $0.65 per document from INIS Section, International Atomic Energy Agency, P. O. Box 590 A-1011, Vienna, Austria

The performances of a continuous wave (CO2, N2, He) laser ionized by an electron beam are calculated. Several types of phenomena are considered: energy exchange processes between molecules of laser medium; electron molecular excitation processes; and aerodynamic phenomena. The energy exchanges accompanying the laser effect generate important quantities of heat, which have to be evacuated by the flow. After a survey of the fundamental assumptions on molecular phenomena, a computer code was developed for following, along the flow, the evolution of the thermodynamic parameters (pressure, temperature), of the laser gain, and of the electrical properties (electron density and temperature). To provide a finer description of the last ones, a model giving the energy distribution of the electrons in the laser medium was established. NSA

N76-27558# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CALCULATION OF MACROSCOPIC PARAMETERS AND ELECTRON DISTRIBUTION FUNCTIONS IN PLASMAS OF CO2-N2 He

J. Bonnet, C. Dahan, G. Fournier, and D. Pigache 1974 41 p refs In FRENCH

(ONERA-NT-238) Avail: ERDA Depository Libraries HC $4.00

Data on macroscopic parameters characterizing the electrons in CO2 laser plasmas are calculated by means of distribution functions. These exact values are compared with those obtained by an approximate method. Author (NSA)

N76-27559# Oak Ridge Y-12 Plant, Tenn.

OPTICAL MEASUREMENTS OF SURFACE QUALITY AND FIGURE OF DIAMOND-TURNED MIRRORS

R. E. Sladky and R. H. Dean 1975 17 p refs Presented at the 7th NBS-ONR-ASTM Symp. on Damage in Laser Mater.

(Contract W-7405-eng-26)

(Y-DA-6328; Conf-750748-2) Avail: NTIS HC $3.50

The largest of these mirrors is flat, elliptical in shape, and 654 mm (25.5 in) on the major axis and 394 mm (15.5 in) on the minor axis. The concave mirrors are 394 mm OD. These mirrors were inspected for surface finish and figure. In addition, the blur circle was measured. Measurements of scattered light were also made. In some cases, the diffraction pattern was related to the waves formed in the surface by the machining process. This information was useful to engineers doing research on the diamond turning of laser materials. Author (NSA)

N76-27560# Oak Ridge Y-12 Plant, Tenn.

SLIDE-POSITION ERRORS DEGRADE MACHINED OPTICAL COMPONENT QUALITY

J. B. Arnold, P. J. Steger, and R. R. Burleson 12 Dec. 1975 27 p refs Presented at the 7th NBS-ONR-ASTM Symp. on Damage in Laser Mater., Boulder, Colo., 30 Jul. 1975

(Contract W-7405-eng-26)

(Y-DA-6346; Conf-750748-1) Avail: NTIS HC $5.00

An ultraprecision lathe is being developed to fabricate optical components for use in high energy laser systems. The lathe has the capability to produce virtually any shape mirror which is symmetrical about an axis of revolution. Two basic types of mirrors are fabricated on the lathe, namely: (1) mirrors which are machined using a single slide motion (such as flats and cylinders), and (2) mirrors which are produced by two-coordinated slide motions (such as hyperbolic reflectors; large, true-radius reflectors, and other contoured-surface reflectors). The surface-finish quality of typical mirrors machined by a single axis of motion is better than 13 nm, peak to valley, which is an order of magnitude better than the surface finishes of mirrors produced by two axes of motion. Surface finish refers to short-wavelength-figure errors that are visibly detectable. Author (NSA)

N76-27561# GTE Labs., Inc., Waltham, Mass.

FLUORESCENCE LINE-NARROWING STUDIES OF Nd: GLASS LASER MATERIALS Final Report

L. A. Riseberg and C. Brecher [1975] 51 p refs

(Contract W-7405-eng-48)

(UCRL-13660; TR-75-029.1) Avail: NTIS HC $5.50

The increasing importance of Nd glass lasers in laser fusion technology has emphasized the inadequacy in the understanding of the optical properties of rare earth ions in glasses. Indeed, it has been difficult to generate models for the performance of these devices, and the selection of host glasses could be done by little more than a trial-and-error approach. The technique of laser-induced fluorescence line-narrowing provides a new and powerful tool for the study of these systems. In this technique, a laser excites within the inhomogeneously broadened absorption bands a selected subgroup of the ions in the system, namely those whose absorption energy is resonant with the laser. If the excitation does not migrate among the entire collection of ions prior to fluorescence, the fluorescence that is observed is only from the group that was excited and is narrowed. This permits the selective study of classes of ion sites within the ensemble. Author (NSA)

N76-27562# California Univ., Livermore. Lawrence Livermore Lab.

NANOSECOND SWITCHING OF HIGH POWER LASER ACTIVATED SILICON SWITCHES

O. S. Zucker, J. R. Long, V. L. Smith, D. J. Page (Westinghouse Res. Labs., Pittsburgh, Pa.), and J. S. Roberts (Westinghouse Res. Labs., Pittsburgh, Pa.) Nov. 1975 23 p refs Presented at the 1st Intern. Conf. on Electron Beam Res. and Technol., Albuquerque, N. Mex., 3-5 Nov. 1975

(Contract W-7405-eng-48)

(UCRL-77449; Conf-751108-13) Avail: NTIS HC $4.50

Light activated multilayered silicon semiconductor devices have been used to switch at MW power levels with ns turnon time. Current rate of rise of 700 kA/ns at 10 kA, with 1 kV across the load have been achieved. Author (ERA)

N76-27563# Air Force Academy, Colo.

UNSTABLE RESONATOR MIRROR MISALIGNMENT MEASUREMENTS Final Report, 1 Jul. 1972 - 30 Jun. 1975

John J. Armstrong and Harald O. Dogliani Jun. 1975 14 p

(AD-A021060; USAFA-TR-75-6; SRL-TR-75-0016) Avail: NTIS CSCL 20/6

Negative branch unstable resonators have the advantage over positive branch unstable resonators of not being as susceptible to mirror misalignment effects. Specifically, as a negative branch resonator mirror is misaligned, the angle at which lasing ceases is significantly larger. The theoretical cease lasing angle is derived using ray optics. The experimental cease-lasing angle is found to lie between this theoretical angle and the 'best case' angle. GRA

N76-27564# United Aircraft Research Labs., East Hartford, Conn.
REDUCTION OF THERMAL BLOOMING BY BEAM OPTIMIZATION Final Report, 1 Oct. 1973 - 30 Sep. 1974
Frederick G. Gebhardt, P. J. Berger, David C. Smith, B. Burdick, and R. Tripodi Oct. 1974 94 p refs
(Contract DAAB07-74-C-0028)
(AD-A020497; UARL-N921769-4) Avail: NTIS CSCL 20/6

The report examines various techniques for reducing the severe thermal distortion effects which represent a serious limitation for high power CO2 laser beams in the atmosphere. The principal accomplishments reported here are in the areas of (1) beam amplitude and phase shaping for reducing CW thermal blooming effects, and (2) the investigation of multiple pulse or pulse train propagation as a means for alleviating the thermal blooming problem. In Section II the studies of beam optimization for CW propagation are discussed. Numerical calculations of the thermal blooming were used to investigate (1) the effects of beam amplitude shaping, and (2) a reciprocity approach for establishing the optimum beam amplitude and phase shape. GRA

N76-27565# Air Force Weapons Lab., Kirtland AFB, N.Mex.
STRONGLY PHASE-ABERRATED NONDIFFRACTION LIMITED LASER BEAMS Final Report
Charles B. Hogge Jan. 1976 70 p
(AF Proj. 3326)
(AD-A020310; AFWL-TR-75-153) Avail: NTIS CSCL 20/5

Both amplitude and phase aberrations usually alter and reduce the intensity of the focal plane distribution of an optical system. Phase fluctuations are generally the more important, if the square root of the ensemble averaged phase variance sigma squared sub I is less than 0.1 wavelength, the reduction in maximum irradiance is given quite well by exp -4 pi squared sigma squared sub I almost without regard to the correlation size of the phase fluctuation. For larger phase distortions, this simple formula will predict a very severe intensity reduction that may be much too pessimistic. In this situation, a careful accounting of the influence of the relative size of the phase correlation length is necessary for an accurate prediction of the intensity reduction. It can be shown, then, that the irradiance profile of the strongly phase aberrated beam can be written approximately as the direct sum of two beams, the respective characteristics of which depend on the phase variance and correlation length. Author (GRA)

N76-27566# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Redstone Arsenal Advanced Sensors Directorate.
LASER HETERODYNE DETECTION
Henry M. Grass Jul. 1975 27 p refs
(DA Proj. 1M3-62303-A-214)
(AD-A020468; RE-76-5) Avail: NTIS CSCL 20/5

The results of a study concerning the feasibility of utilizing laser heterodyne receivers for passively detecting and identifying military targets are presented. It was concluded that laser heterodyne receivers are not practical as target detectors, but given detection they may be useful in target identification. Author (GRA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N76-27567* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONNECTOR Patent
Donald E. Pizzeck, inventor (to NASA) Issued 22 Jun. 1976 4 p Filed 10 Feb. 1975 Supersedes N75-16747 (13 - 08, p 0878)
(NASA-Case-LAR-11709-1; US-Patent-3,964,813; US-Patent-Appl-SN-548468; US-Patent-Class-339-17M; US-Patent-Class-339-18C) Avail: US Patent Office CSCL 13E

A connector is described for connecting circuits located on different layers of a multilayer printed circuit board through a hole in the board. The connector is a hollow cylindrical conductor made from a conductive, metallic, springy material. A slit in the conductor and a plurality of sharp teeth located on the outside of the conductor extend the full length. The conductor has a slightly larger outside diameter than the diameter of the hole. Consequently, when the connector is forced into the hole the springback (resiliency) of the connector forces the teeth against the circuits on the printed circuit board thereby providing a positive connection between the circuits. Official Gazette of the U.S. Patent Office

N76-27568* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CAPILLARY FLOW WELD-BONDING Patent
Robert W. Vaughan (TRW, Inc., Redondo Beach, Calif.) and Robert J. Jones, inventors (to NASA) (TRW, Inc., Redondo Beach, Calif.) Issued 29 Jun. 1976 6 p Filed 2 Jan. 1975 Sponsored by NASA
(NASA-Case-LAR-11726-1; US-Patent-3,697,091; US-Patent-Appl-SN-538047; US-Patent-Class-219-92; US-Patent-Class-219-118) Avail: US Patent Office CSCL 13H

The invention of a weld-bonding technique for titanium plates was described. This involves fastening at least two plates of titanium together using spot-welding and applying a bead of adhesive along the edge of the resistance spot-welded joint which upon heating, flows and fills the separation between the joint components. Official Gazette of the U.S. Patent Office

N76-27569*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMICS OF SOLID LUBRICATION AS OBSERVED BY OPTICAL MICROSCOPY
Harold E. Sliney 1976 22 p refs Proposed for presentation at the Joint Lubrication Conf., Boston, 5-7 Oct. 1976; sponsored by the Am. Soc. of Mech. Engineers and the Am. Soc. of Lubrication Engineers
(NASA-TM-X-71880; E-8653) Avail: NTIS HC $3.50 CSCL 11H

A bench metallograph was converted into a micro contact imager by the addition of a tribometer employing a steel ball in sliding contact with a glass disk. The sliding contact was viewed in real time by means of projection microscope optics. The dynamics of abrasive particles and of solid lubricant particles within the contact were observed in detail. The contact was characterized by a constantly changing pattern of elastic strain with the passage of surface discontinuities and solid particles. Abrasive particles fragmented upon entering the contact, embedded in one surface and scratched the other; in contrast, the solid lubricant particles flowed plastically into thin films. The rheological behavior of the lubricating solids gave every appearance of a paste-like consistency within the Hertzian contact. Author

N76-27570*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROLLING-ELEMENT FATIGUE LIVES OF AISI 52100 STEEL BALLS WITH SEVERAL SYNTHETIC LUBRICANTS
Richard J. Parker 1976 22 p refs Proposed for presentation at the Inst. of Petroleum Symp. on Rolling-Element Fatigue Performance Testing of Lubricants, London, 13-14 Oct. 1976
(NASA-TM-X-73406; E-8731) Avail: NTIS HC $3.50 CSCL 13I

Rolling-element fatigue tests were run with three synthetic lubricants with and without antiwear additives and with a paraffinic mineral oil at race temperatures of 336 to 353 K (146 146 to 175 F). The five-ball fatigue tester was used with steel balls to evaluate the relative fatigue lives with each of six lubricant-additive combinations. The tests were run at 5,520 MPa (800,000psi) maximum Hertz stress, 10,000 rpm shaft speed, and 30 deg contact angle. The lubricants tested have similar kinetic viscosities at 372 K (210 F) ranging from 0.034 to 0.089 sq cm/sec (3.4 to 8.9 cS). At these conditions, the mode of failure in the five-ball fatigue tester was classical subsurface rolling-element fatigue. The baseline for comparison of fatigue life was the paraffinic mineral oil without additives. The effects of the synthetic lubricants and their additives, which are useful for boundary lubrication, oxidation or foam inhibition, were evaluated. Author

N76-27571*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC LUBRICATION OF POINT CONTACTS Ph.D. Thesis - Leeds Univ.
B. J. Hamrock Jun. 1976 275 p refs
(NASA-TM-X-73454; E-7964) Avail: NTIS HC $9.00 CSCL 11H

A procedure for the numerical solution of the complete, isothermal, elastohydrodynamic lubrication problem for point contacts is given. This procedure calls for the simultaneous solution of the elasticity and Reynolds equations. By using this theory the influence of the ellipticity parameter and the dimensionless speed, load, and material parameters on the minimum and central film thicknesses was investigated. Thirty-four different cases were used in obtaining the fully flooded minimum- and central-film-thickness formulas. Lubricant starvation was also studied. From the results it was possible to express the minimum film thickness for a starved condition in terms of the minimum film thickness for a fully flooded condition, the speed parameter, and the inlet distance. Fifteen additional cases plus three fully flooded cases were used in obtaining this formula. Contour plots of pressure and film thickness in and around the contact have been presented for both fully flooded and starved lubrication conditions. Author

N76-27572# Materials Research Labs., Maribyrnong (Australia).
MACHINING TECHNIQUES AND SURFACE INTEGRITY: REPORT ON VISITS TO ESTABLISHMENTS IN USA AND UK, MAY - JUNE 1975
D. M. Turley Dec. 1975 40 p refs
(Rept-643) Avail: NTIS HC $4.00

The machining of aerospace alloys is reported with particular regard to the surface integrity of finished parts. The current state of research into damaged surface layers produced by machining is outlined. Author

N76-27573# Royal Aircraft Establishment, Farnborough (England).
MAGNETIC BEARINGS FOR SPACE TRAVEL AND CONVENTIONAL APPLICATIONS
C. J. Reimers Mar. 1976 13 p Transl. into ENGLISH of Conf. Paper from Deut. Ges. fuer Ortung und Navigation e.V., Duesseldorf Presented at Symp. Gyro-Technol., Heidelberg, Paper 9, 25-26 Apr. 1974 p 211-226
(RAE-Lib-Trans-1890; BR52559; Paper-9) Avail: NTIS HC $3.50

Possibilities offered by modern semiconductor technology which allowed electronic resources for control of magnetic bearings to be kept within reasonable bounds were discussed. A 100N m s electromagnetically supported, all axes active, flywheel and an electrodynamically supported a fly ring are described. Author

N76-27574# Royal Aircraft Establishment, Farnborough (England).
INVESTIGATION OF THE PHENOMENON OF SELECTIVE MIGRATION IN FRICTION
I. V. Kragelskii Mar. 1976 15 p Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (USSR), no. 1, 1975 p 25-32
(RAE-Lib-Trans-1884; BR52558) Avail: NTIS HC $3.50

The manner in which selective migration reduces wear is reviewed. The process involves a series of stages; selective diffusion of atoms from the surface of an alloy, e.g. Sn or Zn from copper alloys, weakening of the surface layer, the formation of an electrostatic field in which metal ions and colloidal particles migrate, and the formation of a surface film from these particles. Specific fluid lubricants, e.g. glycerine, play an important role by inhibiting the formation of oxide films and by providing a medium for particle migration. Author

N76-27575# Royal Aircraft Establishment, Farnborough (England).
THE INVESTIGATION AND SELECTION OF PARAMETERS FOR HARMONIC DRIVES WITH A DISC WAVE GENERATOR
D. P. Volkov and A. F. Krainev Feb. 1976 17 p refs Transl. into ENGLISH from 4th World Congr. on the Theory of Machines and Mech., Paper 20, 1975 p 103-108 Presented at the 4th World Congr. of Machines and Mech., 1975 p 103-108
(RAE-Lib-Trans-1880; BR52719) Copyright. Avail: NTIS HC $3.50

The results are given of investigations into, and recommendations are made for selection of, the basic parameters of harmonic drives with disc wave generators, having diameters of flex splines between 250 and 730 mm, a transmission ratio between 100 and 365 in one mechanism and calculated torsional moments between 5 and 100 kN m. Author

N76-27576# Royal Aircraft Establishment, Farnborough (England).
VIBRATIONS IN GEAR DRIVES; TEST RESULTS AND CALCULATION METHOD FOR DYNAMIC TOOTH FORCES
H. Rettig Feb. 1976 18 p refs Transl. into ENGLISH from 4th World Congr. on the Theory of Machines and Mech., Paper 30, 1975 p 163-168 Presented at the 4th World Congr. on the Theory of Machines and Mech., 1975 p 163-168
(RAE-Lib-Trans-1882; BR52720) Copyright. Avail: NTIS HC $3.50

In order to determine the vibrational forces and the stability of vibrations in a gear assembly, the effect of disturbance factors on the behavior of viscoelastic vibration systems must be known. The extent to which the idealization of such a system is possible without suppression of the important characteristics of the solution is considered. Based on test results and theoretical investigations, a simplified calculation for the determination of the dynamic forces on the teeth is developed. Author

N76-27577# Polish Academy of Sciences, Warsaw.
USE OF A THEORY OF LIMITAL STATES TO DETERMINE STRESSES OF EARTH WORKING MACHINERY [ZASTOSOWANIA TEORII STANOW GRANICZNYCH DO WYZNACZANIA OBCIAZEN MASZYN DO ROBOT ZIEMNYCH]
Lech Dietrich, M. Hawrysz, M. Sliwowski, and W. Trampczynski 27 Oct. 1975 162 p In POLISH
Avail: NTIS HC $6.75

Programs are developed for calculating the field of stress in the process of working ground with a loader scoop. Programs developed include: one for a medium of the Coulombra-Mohra type; and the second for a medium of the Troski type. The differences between them arise from a different approach in composing the basic set of differential equations which control the solution of a set problem, which requires the use of different iteration schemes. The presented calculations of ground resistance in the filling of a loader scoop in a wide range of variation of parameters confirm the correctness of the algorithms used and the logical structure of the entire program. Author

N76-27578# Brookhaven National Lab., Upton, N.Y.
CRYOCONDENSATION PUMPING OF THICK FILMS OF HYDROGEN AND DEUTERIUM
H. J. Halams and J. A. Bamberger 1975 10 p refs Presented at the 6th Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(BNL-20681; Conf-751125-81) Avail: NTIS HC $4.50

In order to obtain engineering data for design of large capacity cryopumps for hydrogen, deuterium and tritium, an apparatus was built where pumping speeds and sticking coefficients can be studied as a function of surface coverage for different leak rates. In addition, thermal conductivity and thermal absorption of these frozen gases can be inferred from the measurements of pumping speed equilibrium pressure and the helium boil-off rate. The following changes in the above parameters were observed when the surface coverage was increased from a few atomic layers to 3.8 x 10 to the 20th power molecules/sq cm for H2 and 1.2 x 10 to the 21st power molecules/sq cm for D2: the pumping speed decreased about 10 percent while the equilibrium pressure and helium boil-off were unchanged within the limits of our measuring accuracy; changing the gas leak rate from 0 to 0.002 Torr liters/sec/sq cm also decreases the pumping speed by approximately 10 percent. Author (NSA)

N76-27579# Oak Ridge Y-12 Plant, Tenn. Metallurgical Development Dept.
ELECTRON-BEAM FILAMENT SPECIFICATION AND GUN CONTOURS
D. G. Scott 5 Nov. 1975 7 p Presented at SME;ERDA Welding and Joining Workshop, Chicago, Ill., 28-30 Oct. 1976
(Contract W-7405-eng-26)

(Y-DA-6352; Conf-751012-11) Avail: NTIS HC $4.50

In making precision, partial penetration, electron beam welds, large variations in the welds were noticed between filament changes. Careful dimensional checking of filaments and grid cups revealed that much of the problem was caused by variations in the grid cup contour. To ensure repeatability of welds, a specification has been written for the purchase of filaments, and grid cups are characterized dimensionally. For a given procedure, grid cups are selected on the basis of dimensions and checked for reproducibility on test welds before being assigned to production. Author (ERA)

N76-27580# Oak Ridge Y-12 Plant, Tenn. Metallurgical Development Dept.

JOINT DESIGN FOR WELDING THIN MATERIALS

1975 9 p

(Contract W-7405-eng-26)

(Y-DA-6354) Avail: NTIS HC $4.50

Techniques were developed for making leak tight welds in 0.254 to 0.508 mm thick stainless steel or other sheet metal containers. Inexpensive sheet metal forming equipment was used to obtain a tight fitting lap joint which made a gas tungsten arc weld possible without the aid of backing materials. Techniques used in making a butt weld in 0.254 to 0.508 mm thick material for enclosure of thick metal parts were also developed. Author (ERA)

N76-27581# Oak Ridge Y-12 Plant, Tenn. Assembly Dept.

COLD WELDING OF ALUMINUM TUBING

J. L. Irons 3 Nov. 1975 7 p Presented at SME;ERDA Welding and Joining Workshop, Chicago, Ill., 28-30 Oct. 1975

(Contract W-7405-eng-26)

(Y-OA-1550; Conf-751012-12) Avail: NTIS HC $4.50

Cold welding of aluminum tubing is accomplished by applying pressure to radiused anvils from both sides of the cross section to be welded. The portion of the tube being welded is restrained within the fixture during the welding operation to limit diameter changes. The cold welding method produces a highly reliable metallurgically bonded joint and is adaptable to most tubing closure applications, where accessibility is provided for welding tooling. Author (ERA)

N76-27582# Oak Ridge National Lab., Tenn.

DEVELOPMENT OF AUTOMATED PIPE AND TUBE WELDING TECHNIQUES FOR ALUMINUM

D. P. Edmonds, G. M. Goodwin, and G. M. Slaughter 1975 11 p Presented at SME;ERDA Wedling and Joining Workshop, Chicago, Ill., 28 Oct. 1975 Sponsored by ERDA

(Conf-751012-6) Avail: NTIS HC $4.00

Automated orbital welding techniques were applied to Al alloy 3003 pipe and tubing, and considerable savings of money and time were achieved. ERA

N76-27583# Oak Ridge National Lab., Tenn.

ADVANCES IN STAINLESS STEEL WELDING FOR ELEVATED TEMPERATURE SERVICE

G. M. Goodwin, N. C. Cole, R. T. King, and G. M. Slaughter Oct. 1975 11 p refs Presented at SME; ERDA Welding and Joining Workshop, Chicago, 28 Oct. 1975 Sponsored by ERDA

(Conf-751012-7) Avail: NTIS HC $4.00

An extensive program to characterize the microstructures and determine the mechanical properties of stainless steel welds is described. The amount, size, shape, and general distribution of ferrite in the weld metal was studied. The effects of electrode coatings on creep-rupture properties were determined as were the influences of slight differences in analyzed contents of carbon, silicon, phosphorus, sulfur, and boron. Using the above information, a superior commercially produced electrode was formulated which took advantage of chemical control over boron, titanium, and phosphorus. This electrode produced deposits exhibiting superior mechanical properties and it was successfully utilized to fabricate a large nuclear reactor vessel. Author (ERA)

N76-27584# Atomics International, Golden, Colo. Physical Metallurgy Group.

CHARACTERIZATION OF BRAZING ALLOYS WITH STAINLESS STEELS

D. H. Riefenberg, J. H. Doyle, R. F. Hillyer, and W. S. Bennett 19 Sep. 1975 30 p

(Contract E(29-2)-3533)

(RFP-2233) Avail: NTIS HC $4.00

To simulate braze joints, qualitative X-ray mapping of the elemental interactions between brazing alloys and two common types of stainless steels was performed via the electron microprobe. In general both steels, Types 304L and 21-6-9, react with a particular brazing alloy in a similar manner, the exceptions being the gold-copper brazing alloys which show deeper penetration into the 21-6-9 stainless steel. Author (ERA)

N76-27585# Argonne National Lab., Ill.

MECHANIZED WELDING IN A GLOVE BOX

M. A. Pugacz Oct. 1975 6 p Presented at SME;ERDA Welding and Joining Workshop, Chicago, Ill., 28-30 Oct. 1975

(Contract W-31-109-eng-38)

(Conf-751012-9) Avail: NTIS HC $4.50

An orbital-tungsten-arc welding gun was installed in a helium glove box to automatically weld final end closures to capsules that were to contain an atmosphere of required composition and quality. A fixture, tooling, and procedures were developed to automatically position the tungsten electrode repetitively with respect to the end of the tube to be welded closed. Author (ERA)

N76-27586# National Centre of Tribology, Risley (England). European Space Tribology Lab.

THERMAL VACUUM ACCELERATED LIFE TEST OF THE UNIT QUALIFICATION MODEL MSDS 3 MARCONI LOW SPEED MECHANISM

D. A. Appleton [1975] 22 p Sponsored by ESA

(ESRO-ESTL-17; ESA-CR(P)-799) Avail: NTIS HC $3.50

The thermal vacuum accelerated life test of a solar array unit qualification mechanism (MSDS 3) is described. Most of the test was conducted with the shaft of the mechanism rotating at one revolution per hour, which is 24 times normal speed. The test was conducted at two different temperature conditions, and included additional thermal cycling of the shaft temperature to simulate conditions of earth eclipse of a satellite in a geostationary orbit. Throughout the test there was no change in the motor power required to drive the shaft, and the electrical noise levels on the slip rings showed no significant deterioration. Author (ESA)

N76-27587# Marconi Space and Defence Systems Ltd., Camberley (England).

LUBRICATION OF BEARINGS AND SLIP RINGS IN VACUUM Progress Report, Jan. 1974 - Mar. 1975

M. M. Dullingham Paris ESA Feb. 1976 84 p refs

(Contract ESTEC-1852/73-AA)

(ESA-CR-575; T(F)S/100) Avail: NTIS HC $5.00

The tests reported earlier continue to show good performance with the exception of the failure of one grease lubricated bearing rig and a shut down, due to a large leak, of one lead film lubricated bearing rig. The 100 rpm lead film lubricated bearings have lives ranging from 31,000 to 39,000 hrs while grease lubricated bearings have been operating for 33,000 to 35,000 hrs without significant change in performance. Lead film lubricated bearings operating at 1/90 rpm and having lives ranging from 31,000 to 37,000 hrs also show consistent behavior. A slip ring rig designed to test both power and signal noise levels has run in vacuum for 17,000 hrs. Apart from the electrical noise performance data collected, wear information, important for predicting brush lives, was also obtained. Author (ESA)

N76-27588# General Electric Co., Schenectady, N.Y. Gas Turbine Products Div.

HEAVY-DUTY MARINE GAS TURBINE PROJECT. TASK 5: REGENERATOR IMPROVEMENT. VOLUME B: (PRESSURE TUBE DESIGN) Final Report

S. M. Kaplan 1 Jun. 1975 234 p

(Contract MA-0-35510)

(PB-249787/3; Rept-75GTD20-Vol-B;

MA-RD-930-76025-Vol-B) Avail: NTIS HC $8.00 CSCL 21E

The regenerator improvement of the heavy-duty gas turbine development program (MARAD Project) is described. The MARAD Project is an integrated effort to develop the heavy-duty gas

turbine as an alternate competitive form of marine power generation. Design, development, analyses and component testing are discussed. State of the art developments in brazing were incorporated into the fabrication effort. Task efforts culminated in system-level testing of a 1/10 section, full-scale module of the pressure tube design concept. Additional effort is needed to transform the pressure tube regenerator from a concept to a production design. Author

N76-27589# Army Materiel Command, Texarkana, Tex. Intern Training Center.
MAGNETIC FLUID SEALING OF A SLIDING SHAFT Final Report
Ronald W. Kaese Dec. 1975 62 p refs Prepared jointly with Texas A and M Univ., College Station.
(AD-A020506; USAMC-ITC-02-08-76-409) Avail: NTIS CSCL 11/1

The objective of this paper is to provide a design modification, using ferrofluid sealing, for the SCAMP Crimping Tool Module; while providing a step-by-step procedure for the design of ferrofluid sealing for a class of sliding shafts. This includes the formulae, derivations, assumptions and alternatives. Also presented for the reader is a brief familiarization with ferrofluid characteristics, capabilities and terminology. Author (GRA)

N76-27590# Vanderbilt Univ., Nashville, Tenn.
RELIABILITY OF DEFECT DETECTION IN WELDED STRUCTURES Interim Report
P. F. Packman, J. K. Malpani, F. M. Wells, and B. W. E. Yee 1975 29 p refs
(Contract F44620-73-C-0073; AF Proj. 6183; AF Proj. 9782) (AD-A019660; AFOSR-75-1603TR) Avail: NTIS CSCL 14/2

An analysis has been made of the ability of several nondestructive inspection procedures to reliably detect surface fatigue cracks. It is shown that the ability of penetrant systems of aluminum and titanium are over 90% for cracks whose surface length is greater than 0.939mm (0.037 in.) in length and decreases for cracks less than this value. The probability of detection of these cracks, given that the crack is present has been determined at 90, 95, and 99% confidence factors. The conditional probabilities associated with an error call have also been developed. For this analysis four outcomes were defined: (1) The detection of a crack that is present; (2) The missing of a crack that is present; (3) The detection of a crack that does not exist (false call); and (4) The verification that a part does not contain a flaw. Using Bayes theorem, the conditional probabilities have been established in terms of a material quality factor, an error probability ratio and a success probability ratio. The results of two inspectors, one with a 6% error probability, and the other with a 36% error probability have been examined. GRA

N76-27591# Solar, San Diego, Calif.
PARAMETRIC STUDY OF DIFFUSION BONDED BUTT JOINTS
M. E. Gulden, A. G. Metcalfe, and E. C. Thorsrud Nov. 1975 160 p refs
(Contract DAAG46-75-C-0040; DA Proj. 1X0-12191-CC-63) (AD-A019450; RDR-1801; AMMRC-CTR-75-29) Avail: NTIS CSCL 13/8

The objective of this program was to establish adequate technology background to apply continuous seam diffusion bonding to fabricate helicopter rotor spars from Ti-6Al-4V sheet material. The following areas were investigated: identification of the cause of joint failure along original sheet edge; a parametric study to determine the degree of control required to achieve high quality diffusion bonded joints; determination of the tolerance of the process for fit-up, material preparation and contaminants; identification of methods to repair defective joints; and applicability of various nondestructive inspection techniques. Joint quality was determined by various mechanical tests, including bend, tensile and fatigue, metallography and scanning electron microscopy. Author (GRA)

N76-27592# Oregon Graduate Center for Study and Research, Beaverton. Dept. of Materials Science.
EXPLORATORY DEVELOPMENT OF IMPROVED CUTTING TOOLS FOR TITANIUM Final Report, 1 Apr. 1971 - 5 Dec. 1974
E. Rudy Wright-Patterson AFB, Ohio AFML Jun. 1975 122 p refs
(Contract F33615-71-C-1385; AF Proj. 7350)
(AD-A019750; AFML-TR-75-60) Avail: NTIS CSCL 13/9

Substoichiometric WC-Ni sintered carbide cutting tools, optionally doped with small quantities of selected carbonitrides and carbides for grain size control, show significantly improved resistance to localized crater wear over conventional C-2 and C-3 grade carbides in turning Ti6Al4V alloy, at about equivalent flank wear resistance. The best performing alloys are those with a dual grain structure of respectively, 1 to 2 micrometers and 6 to 10 micrometers tungsten carbide, binder contents between 16 and 9 percent by weight, and carbon deficiencies corresponding closely to the borderline of eta-carbide formation. The alloys can be prepared substoichiometric in bulk or by controlled surface depletion of carbon by exposure to reducing atmospheres. Improvements achieved with cobalt-bonded tools of similar stoichiometries were less than with the nickel-bonded tools. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N76-27593# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
FAILURE ANALYSIS AS A MEANS FOR PREVENTION OF COMPONENT FAILURE IN AVIATION
E. A. B. DeGraaf 1 Apr. 1975 12 p ref In GERMAN Presented at the DGLR Annual Meeting Zerstoerungsfreie Pruefverfahren, Berlin 5-7 May 1975
(NLR-MP-75009-U) Avail: NTIS HC $3.50

Techniques used in and examples from service failure analyses as carried out over many years are described. Metallographic and structural aspects of failure analysis are treated in particular, and examples of feedback from service failure analyses into nondestructive inspection are given. Author (ESA)

N76-27594# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
CALIBRATION OF COBALT 60 SOURCES FOR THE DUTCH ROYAL AIR FORCE
J. B. T. Aten Nov. 1975 13 p In DUTCH; ENGLISH summary
(Contract A71/KL/037)
(MBL-1975-26; TDCK-67112) Avail: NTIS HC $3.50

Radiac survey meters, for the use of the Dutch Royal Air Force, are checked periodically using cobalt 60 with well-known activity. Owing to the rather short half-life of cobalt 60 (5.26 years) these sources have to be renewed at regular intervals. To satisfy the legal regulations the reactivated sources have to be tested for leakage and contamination and the activity, quoted by the manufacturer, has to be confirmed. The way, in which the various checks were performed, is described. Author (ESA)

N76-27279* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Quality Assurance DSN and Mechanical Hardware Section.
MODIFICATION OF MOORE MEASURING MACHINE/LEITZ MICROSCOPE
H. A. Greth and L. Brubaker *In its* The Deep Space Network 15 Jun. 1976 p 147-154 refs (For availability see N76-27262 18-12)
CSCL 14D

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N76-27595 Colorado State Univ., Fort Collins.
BEHAVIOR AND DESIGN OF DOUBLE-TAPERED PITCHED AND CURVED GLULAM BEAMS Ph.D. Thesis
Vijaya Krishna Arya Gopu 1975 297 p
Avail: Univ. Microfilms Order No. 76-13636

A rational design procedure based on experimental and theoretical studies is developed. The experimental study consisted of testing six full size unreinforced and two reinforced beams at both working and ultimate loads. The experimental stress distributions obtained from strain measurements, showed generally excellent agreement with those predicted by an orthotropic trapezoidal finite element model. Both the reinforced and unreinforced beams failed by radial tension separation of the wood fibers in zones of maximum radial tension. The higher load carrying capacity of the reinforced beams is attributed to lower radial tension stresses induced in the wood fibers of these beams. As a part of the theoretical study, a highly automated finte element program was developed to analyze reinforced and unreinforced beams over a wide range of geometric configurations. Dissert. Abstr.

N76-27596 California Univ., Los Angeles.
THE VELOCITY AND ATTENUATION OF ELASTIC WAVES IN TWO PHASE COMPOSITES Ph.D. Thesis
Amiya Kumar Chatterjee 1976 142 p
Avail: Univ. Microfilms Order No. 76-12197

Two related problems were considered. In the first problem the solution of the diffraction of plane P - and S-Waves incident in a composite containing an arbitrary number of imperfectly bonded identical spherical inclusions were obtained. These results were then used to find the average elastic moduli and the attenuation due to scattering in the presence of an ensemble of inclusions. In the second problem the diffraction by a viscous fluid filled crack was considered. The solution was used to calculate average elastic moduli as well as the attenuation due to scattering in the presence of an ensemble of randomly oriented cracks. The results are valid at low frequencies and small concentrations of the inclusions. In the first problem the calculations were carried out to the second order in the concentration while in the second problem these second order terms were ignored. Dissert. Abstr.

N76-27597 Engineering Sciences Data Unit, London (England).
DRAG OF TWO-DIMENSIONAL STEPS AND RIDGES IMMERSED IN A TURBULENT BOUNDARY LAYER FOR MACH NUMBERS UP TO 3
Nov. 1975 24 p Supersedes ESDU-73028
(ESDU-75031; ISBN-0-85679-135-0) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC $242.50

Charts given in this item were derived from experimental data for excrescences transverse to the stream in a turbulent boundary layer on a flat wall (corresponding to a flat plate at zero incidence), covering the Mach number range up to 3; they apply to airflow with zero heat transfer and zero pressure gradient and are considered valid for excrescences with heights up to about one tenth of the boundary-layer thickness. Guidance on other aspects of applicability, including the presence of streamwise pressure gradients, is given. Notes on the accuracy are also given. ESDU

N76-27598 Engineering Sciences Data Unit, London (England).
GEOMETRICAL PROPERTIES OF CRANKED AND STRAIGHT TAPERED WING PLANFORMS
Jan. 1976 15 p Supersedes ESDU/A/W.00.01.01
(ESDU-76003; ISBN-0-85679-136-0) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $146.50

Information is presented concerning the reference lengths and reference points commonly used for cranked and uncranked wings with straight edges and chordwise or pointed tips. It is emphasized that in practical situations the aerodynamic center of a wing does not occur at the quarter-chord point of the aerodynamic mean chord. The standard mean chord of a wing is also used as a reference length to non-dimensionalize pitching moment coefficients. In practice, this chord is positioned on the wing center-line so that its quarter-chord is coincident with the quarter-chord point of the aerodynamic mean chord. ESDU

N76-27599*# Lockheed-Georgia Co., Marietta.
FINITE ELEMENT COMPUTER PROGRAM TO ANALYZE CRACKED ORTHOTROPIC SHEETS Final Report
C. S. Chu, J. M. Anderson, W. J. Batdorf, and J. A. Aberson Jul. 1976 88 p refs
(Contract NAS1-13605)
(NASA-CR-2698) Avail: NTIS HC $5.00 CSCL 13M

A two dimensional orthotropic sheet with through-the-thickness cracks and temperature gradient was analyzed. The program includes special crack tip elements that account for singular stress fields associated with crack opening and crack sliding displacements at the crack tip. The program also includes a linear spring element and a constant strain, triangular element. A number of problems for which closed form solutions exist were analyzed to demonstrate the capabilities of the program. Author

N76-27600*# Martin Marietta Corp., Denver, Colo.
INVESTIGATION AND EVALUATION OF FRACTURE PROPERTIES OF THIN GAUGE TANKAGE ALLOYS FOR TUG, VOLUME 1 Final Report, 5 Mar. 1975 - 2 Apr. 1976
C. F. Fiftal and R. G. Karsten Apr. 1976 167 p
(Contract NAS8-31253)
(NASA-CR-149940; MCR-76-219-Vol-1) Avail: NTIS HC $6.75 CSCL 13M

Service-simulating fracture properties for 2219-T87 aluminum parent material, as-welded material, repair-welded material, and mismatch-welded material in 0.081 cm, 0.109 cm, 0.157 cm and 0.254 cm thickness at 20 K, 77 K, and 294 K are presented. Tensile tests, proof tolerance tests, and simulated service cycling-to-leak tests on surface flaws (shape ratio $a/2C = 0.3$-0.4), and fracture toughness and simulated service cycling-to-fracture tests on through-flaws were conducted. Author

N76-27601# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL STRESS DISTRIBUTION OF A DOUBLE-CANTILEVER BEAM WITH A SIDE NOTCH
W. F. Kirkwood and M. E. Prado 5 Nov. 1975 23 p refs Presented at the 9th Natl. Symp. on Fracture Mech., Pittsburgh
(Contract W-7405-eng-48)
(UCRL-77116-Rev-1; Conf-750836-2) Avail: NTIS HC $4.50

The effect of a side notch used as a crack guide in a double-cantilever-beam specimen is investigated. The resulting stress distribution along the section of symmetry ahead of the notch is obtained from a three-dimensional photoelastic model. The effect of the side notch, through the thickness and down the side of the specimen is determined. After stress freezing, the model was sliced along principal planes. Along the x-x plane of symmetry, the principal stresses were determined by graphical integration of Filon's transformation of the Lame'-Maxwell equations and by subslicing along the x-z plane. Results of the investigation are in good agreement with those of other investigators. The side notch increases the value of the maximum tensile stress at the intersection of the starter notch and the side notch by approximately 22 percent. Author (ERA)

N76-27602# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
COMMENTS ON NONLINEAR TRANSIENT STRUCTURAL ANALYSIS
J. A. Stricklin, W. E. Haisler, and W. A. VonRiesemann (Sandia Labs., Albuquerque, N. Mex.) 1975 21 p refs Presented at the Ann. Meeting of the ASME, Houston, Tex., 30 Nov. 1975 Sponsored by ERDA
(SAND-75-5643; Conf-751106-14) Avail: NTIS HC $4.50

The various aspects of nonlinear analysis are discussed, including development of the governing equations, plasticity theory, and solution procedures. The underlying principle of virtual work is developed for the case of large strains in terms of both the true Cauchy stress and the 2nd Piola-Kirchhoff stress tensors. The pseudo force method is reviewed and detailed expressions are given for the pseudo force terms. For the case of large strains, the updated Lagrangian formulation is presented and discussed at length. Various numerical solution (temporal integration) procedures are reviewed. The shortcomings of current plasticity theories are discussed. Finally, numerical solutions for

shells of revolution are presented to illustrate the type of nonlinear transient analyses currently being conducted. Author (ERA)

N76-27603# Sandia Labs., Albuquerque, N.Mex.
MIXED BOUNDARY VALUE PROBLEMS IN POTENTIAL THEORY FOR A CYLINDRICAL SHELL
L. M. Keer and H. A. Watts Nov. 1975 16 p refs
(Contract AT(29-1)-789)
(SAND-75-0543) Avail: NTIS HC $3.50

Two mixed boundary value problems for a semi-infinite cylindrical shell are solved. For both problems the normal derivative of the potential function is taken as zero on the inner and outer shell walls. The boundary conditions at the end of the shell are mixed with respect to the potential function and its normal derivative. The problems are formulated using integral transforms in a manner leading to a singular integral equation which can be solved by numerical means. Intensity factors along the circumference separating the mixed conditions are computed and compared with known limiting cases. Author (ERA)

N76-27604# Atomic Energy of Canada Ltd., Pinawa (Manitoba).
A FINITE ELEMENT COMPUTER PROGRAM FOR THE CALCULATION OF THE RESONANT FREQUENCIES OF ANISOTROPIC MATERIALS
W. M. Fleury Sep. 1975 62 p refs
(AECL-5234) Avail: ERDA Depository Libraries HC $5.50; AECL $2.00

A set of computer programs for the calculation of the flexural and torsional resonant frequencies of rectangular section bars of materials of orthotropic or high symmetry are described. The calculations are used on the experimental determination and verification of the elastic constants of anisotropic materials. The simple finite element technique employed separates the inertial and elastic properties of the beam element into station and field transfer matrices respectively. It includes the Timoshenko beam corrections for flexure and Lekhnitskii's theory for torsion-flexure coupling. The programs also calculate the vibration shapes and surface nodal contours or Chladni figures of the vibration modes. Author (NSA)

N76-27605# Princeton Univ., N.J. Plasma Physics Lab.
ANALYSIS OF LAMINATED BEAMS FOR USE IN COIL DESIGN
J. Bialek 1975 13 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract E(11-1)-3073)
(Conf-751125-102) Avail: NTIS HC $3.50

Recent experimental data have shown that equivalent beam theory is inadequate for predicting the deformation of large circular toroidal field coils. The latest analyses have shown that shear plays an important role in the deformation of the coils. This situation has indicated the need to analyze in explicit detail, the layer to layer behavior of simple laminated structures. The progress made to date in analyzing a laminated beam is summarized. By using variational techniques, the deflections and stresses in each layer of a laminated beam are modeled. To date, reasonable results have been obtained for either deflection or stress separately. Brief descriptions of the mathematical models used and the results obtained with each are presented. Author (NSA)

N76-27606# Princeton Univ., N.J. Plasma Physics Lab.
STRESS ANALYSIS OF PLT COIL
J. Frankenberg and R. A. Smith (Westinghouse Electric Corp., Pittsburgh) 1975 13 p refs Presented at the Sixth IEEE Symp. on Eng. Probl. of Fusion Res., San Diego, Calif. 17 Nov. 1975 Sponsored by ERDA
(CONF-751125-104) Avail: NTIS HC $3.50

The toroidal field coils of Tokamak devices create a field within the torus whose strength varies inversely with distance from the machine center. This field, crossing the current in the TF coils, creates a magnetic pressure on the coil. The pressure produces a net inward centering force, countered by pressure on the wedge face, and a vertical separating force, causing tensile stress across the horizontal mid-plane. In the past these forces have been analyzed by superposition and beam theory. Because of the size and complexity of the PLT machine it was decided to also initiate a finite element analysis of the coil. Both methods of analysis are described. Author (NSA)

N76-27607# National Aerospace Lab., Emmeloord (Netherlands).
DESCRIPTION OF THE STATIC DEFORMATION MEASUREMENTS ON THE ITOS STRUCTURE RCA 1769701
P. J. Sevenhuysen Paris ESA Dec. 1975 69 p refs
(Contract ESTEC-1758/72)
(ESA-CR-572) Avail: NTIS HC $4.50

The test specifications, test set up, measurement and data processing procedures, presented results, and accuracy of the presented results are described. The deformation measurements were carried out successfully. Errors in the results are small, and they are comparable to results of finite element analysis. Results of the hysteresis measurements are suitable for investigation of some hysteresis characteristics of the ITOS structure. Author (ESA)

N76-27608# Naval Undersea Center, San Diego, Calif.
THREE-DIMENSIONAL GREEN'S FUNCTIONS FOR A SEMI-INFINITE ELASTIC MEDIUM Report for Jun. - Sep. 1974
N. A. Ley Jan. 1976 12 p refs
(AD-A020626; NUC-TP-500) Avail: NTIS CSCL 20/11

As an aid in the study of certain boundary value problems, the Green's functions are calculated for a homogeneous, isotroptic, elastic half-space. These functions represent the three-dimensional displacements due to time-harmonic point loads applied on the free surface. A brief discussion is presented on the numerical evaluation of the solutions. GRA

N76-27609# Watervliet Arsenal, N.Y.
SOME OBSERVATIONS ON TWO THEOREMS IN THE THEORY OF STABILITY OF NON-CONSERVATIVE ELASTIC SYSTEMS
G. L. Anderson Dec. 1975 23 p refs
(AD-A020423; WVT-TR-75069) Avail: NTIS CSCL 20/11

The analytical conditions, for which the critical loads of flutter and divergence of an undamped, non-gyroscopic elastic system of two degrees of freedom subjected to circulatory forces which are equal are derived. These theoretical results are applied to a non-conservatively loaded double pendulum having elastic hinges and an elastic support at its free end. Numerical values of the support stiffness parameter, the force orientation parameter, and the equal critical flutter and divergence loads are reported. GRA

N76-27610# Wisconsin Univ., Madison. Mathematics Research Center.
MINIMUM-WEIGHT DESIGN OF VIBRATING ELASTIC STRUCTURES WITH DYNAMIC DEFLECTION CONSTRAINT Technical Summary Report
N. C. Huang Oct. 1975 29 p refs
(Contract DAAG29-75-C-0024)
(AD-A020211; MRC-TSR-1579) Avail: NTIS CSCL 20/11

This report examines the minimum-weight design of linearly elastic structures subject to forced vibration caused by a set of prescribed loads. The design is constrained by a prescribed amplitude of vibration at a specific point on the structure. A necessary and sufficient condition for stationary total weight of the structure is derived by means of the calculus of variations using the principle of stationary mutual potential energy including inertia force. Optimal design problems of elastic rods, beams and trusses with lumped masses are presented as applicational illustrations. An iterative process is established for computing optimum rods and beams. GRA

N76-27611# Army Materials and Mechanics Research Center, Watertown, Mass. Applied Mechanics Research Lab.
A SURVEY OF FRACTURE DESIGN PRACTICES FOR ORDNANCE STRUCTURES
Jiro Adachi Mar. 1968 83 p refs
(DA Proj. 1C0-14501-B-32A)
(AD-A020306; AMMRC-MS-68-03) Avail: NTIS CSCL 20/11

Numerous catastrophic failures and extreme unreliability of weapons in the past have led to design procedures which apply not only mathematical and laboratory analysis but also systematic 'design by experiment' approaches. Full-scale testing under actual field conditions is a key part of present-day weapons

programs. The principal deterrent to brittle failure in materials of moderate strength has been the ability to provide tough materials. The use of very high strength materials to meet the military requirement for lightweight, airtransportable, highly mobile weapons has created the need for more meaningful and usable measures of toughness in materials since 'obviously safe' toughness values cannot always be provided. Weapons designers now must be knowledgeable in the fracture behavior of the less ductile materials and proficient in the use of advanced techniques in stress analysis and fracture analysis. The standard requirement for successful field test performance under severe use conditions continues to be of great importance. Since critical ordnance problems involve many complicating factors, recent linear elastic fracture mechanics developments are usable only as guides for preliminary proportioning. The endurance life test remains a key mandatory criterion for establishing finite life limits.

Author (GRA)

N76-27612# Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.

THE JOINT COMMITTEE, SCOPE, ACTIVITIES, RECENT PROGRESS

Lynn S. Beedle Sep. 1975 35 p refs

(Grant NSF ENG-74-00503-A01)

(PB-248680/1; LEHIGH/FL/369-166) Avail: NTIS HC $4.00 CSCL 13M

The Joint Committee on Tall Buildings addresses itself to the ultimate objective: A better urban environment through improved planning and design of tall buildings. Subject areas include planning, environment, building systems, loading, and structural design of steel and concrete buildings. The functional system features extensive interaction amongst design professionals (engineers, architects, planners, social scientists). Current activities are centered around developing a monograph, a broader data base, the stimulus of needed research, and implementation of findings. Tall building 'successes' result most often when the total system interactions and human requirements are given full attention. GRA

N76-27613# Army Electronics Command, Fort Monmouth, N.J.

A NEW VIBRATION DATA ANALYSIS SYSTEM

F. Warner and Harold Ward Aug. 1975 72 p

(AD-A020855; ECOM-4348) Avail: NTIS CSCL 20/11

A new vibration data analysis system for processing accelerometer power spectral density (PSD) data computed on an existing spectral analysis facility has been developed and incorporated into the shock and vibration laboratory of the Mechanical Engineering Division, U.S. Army Electronics Command. The new data processing system is based on a programmable calculator and suitable peripheral equipments. PSD functions computed on a multi-channel, narrow band, swept frequency, spectral analyzer are scanned, digitized, and punched on paper tape for later processing on the programmable calculator system. User developed software provides for the computation of new PSD functions, acceleration, and double amplitude displacement curves. The computed functions are displayed on a digital X-Y plotter. Hardware and software implementation of the new instrumentation system are described. GRA

N76-27614# Army Natick Development Center, Mass.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE BUCKLING OF RECTANGULAR CYLINDERS

Earl C. Steeves Feb. 1976 40 p refs

(DA Proj. 1J6-62708-O-552; DA Proj. 1E6-62703-A-090)

(AD-A020839; NDC-TR-75-99-AMEL) Avail: NTIS CSCL 20/11

Classical plate buckling theory is used to model the buckling problem for rectangular cylinders. Solutions to the resulting equations are found directly for the case of a uniformly loaded cylinder and by approximate techniques for the nonuniformly loaded cylinder. Results from a series of experiments to determine the buckling load are presented and compared with predictions from the theory. These comparisons reveal the need to examine geometrically nonlinear buckling problems to more closely model the situation present during the compression loading of rectangular cylinders. In addition, the need to include inelastic behavior for cylinders of low aspect ratio is also revealed. Author (GRA)

N76-27615# Arizona Dept. of Transportation, Phoenix.

STRUCTURAL DESIGN OF ASPHALT PAVEMENTS (ARIZONA)

R. A. Jimenex (Arizona Transportation and Traffic Inst., Tucson) May 1975 132 p refs

(PB-249843/4; ADOT-RS-13-142; FHWA-RD-76-S0439) Avail: NTIS HC $6.00 CSCL 13B

Laboratory studies of flexural fatigue showed that the eleven field paving mixtures could be separated into four distinct groups. Examination of data obtained from a questionnaire and loadometer reports produce a simple procedure for estimating the load and number for each of 5 design axles. The study indicated a need to obtain tire inflation pressure and a separation of front axles from single axles in the standard W4 table. Dynaflect pavement deflection data showed their great dependence on the surface and base courses (K1) and much less dependence on subgrade (E3). A new procedure for determining compression fatigue and E3 for subgrade soils under repetitive loadings is suggested.

GRA

N76-27616# Alabama State Highway Dept., Montgomery.

EVALUATION OF VIBRA-TENSION FOR INSPECTION OF TENSION OF PRESTRESSING STRANDS Final Report

Aug. 1974 25 p refs Sponsored by DOT

(PB-249608/1; HPR-74) Avail: NTIS HC $3.50 CSCL 13C

Vibra-Tension was evaluated as a means of measuring tension in prestressing strands for prestressed concrete. Vibra-Tension works on the principle of the 'vibrating string' formula T = 4M(L squared)(F squared) where T is the strand tension, M is mass per unit length of strand, L is the length of the vibrating strand, and F is the strand frequency of vibration. When certain settings peculiar to the size of the strand and the length of the vibrating strand are made on the Vibra-Tension, the strand tension is a function of the frequency of vibration of the strand. Vibra-Tension measurements were compared with strand tensions computed from strand elongation. GRA

42 GEOSCIENCES (GENERAL)

N76-27617*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.

BASIC RESEARCH AND DATA ANALYSIS FOR THE EARTH AND OCEAN PHYSICS APPLICATIONS PROGRAM AND FOR THE NATIONAL GEODETIC SATELLITE PROGRAM Semiannual Status Report, Jan. - Jun. 1976

Jul. 1976 61 p refs

(Grants NGR-36-008-204; NGL-36-008-093;

OSURF Proj. 3820-A1; OSURF Proj. 2514)

(NASA-CR-148326; SASR-6; SASR-18) Avail: NTIS CSCL 08E

Various technical objectives, research and data analysis are presented for utilization in the Earth and Ocean Physics Applications Program and the National Geodetic Satellite Program. The subjects discussed are: (1) theoretical investigations related to Doppler observations, (2) geodetic network distortions from satellite observations, (3) earth rotation and plate motions, (4) the orientation of the earth from laser ranging, (5) monitoring of crustal movements in the San Andreas Fault zone by a satellite-borne ranging system, (6) optimum geometric utilization of LAGEOS, (7) LAGEOS validation plan, and (8) optimal design of the VLBI experiment. Lastly reference is made to further efforts in the continuing programs. L.S.

N76-27618# California Univ., Livermore. Lawrence Livermore Lab.

PROGRAM REPORT: FY 1975, ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION, PHYSICS DEPARTMENT

J. B. Knox, ed. and R. C. Orphan, ed. 8 Oct. 1975 34 p refs

(Contract W-7405-eng-48)

(UCRL-51444-75) Avail: NTIS HC $5.00

The FY 1975 research program conducted by the Atmospheric and Geophysical Sciences Division and supporting segments at

Lawrence Livermore Laboratory is reviewed briefly. Specific projects are described, and significant findings of the work are indicated. Unique numerical modeling capabilities in use and under development are described. Applications in regional atmospheric modeling, the San Francisco Bay area air pollution model, studies on the climatic effects of nuclear explosions, research on precipitation scavenging, and studies of the interaction of wind and surface dust are discussed. NSA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N76-27619*# Naples Univ. (Italy).
LAND SLIDES INVESTIGATION IN SOUTHERN ITALY (ARDUO PROJECT)
Luigi G. Napolitano, Principal Investigator [1975] 6 p Sponsored by NASA ERTS
(E76-10368; NASA-CR-147960) Avail: NTIS HC $3.50 CSCL 08M

There are no author-identified significant results in this report.

N76-27620*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APPLICATION OF SATELLITE DATA IN THE DETERMINATION OF OCEAN TEMPERATURES AND CLOUD CHARACTERISTICS AND STATISTICS Final Report
Robert J. Curran, Vincent V. Salomonson, and William Shenk, Principal Investigators [1975] 124 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E76-10382; NASA-TM-X-72599) Avail: NTIS HC $5.50 CSCL 04B

The author has identified the following significant results. The major shortcoming of the data was the loss of the infrared radiances from the S191 spectrometer. The cloud thermodynamic phase determination procedure was derived and tested with the data collected by the S192 multispectral scanner. Results of the test indicate a large fraction of the data could be classified thermodynamically. An added bonus was the inclusion of snow in the classification approach. The conclusion to be drawn from this portion of the effort is that in most cases considered ice clouds, liquid water droplet clouds, and snow fields can be spectroscopically separated to a high degree of accuracy.

N76-27621*# Department of Scientific and Industrial Research, Wellington (New Zealand).
DEVELOPMENT OF REMOTE SENSING TECHNOLOGY IN NEW ZEALAND, PART 1. MAPPING LAND USE AND ENVIRONMENTAL STUDIES IN NEW ZEALAND, PART 2. INDIGENOUS FOREST ASSESSMENT, PART 3. SEISMOTECTONIC, STRUCTURAL, VOLCANOLOGIC AND GEOMORPHIC STUDY OF NEW ZEALAND, PART 4 Quarterly Report
Mervyn C. Probine, Richard P. Suggate, Ian F. Stirling, and Michael G. McGreevy, Principal Investigators Jun. 1976 69 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10389; NASA-CR-148203; Rept-531; QR-2) Avail: NTIS HC $4.50 CSCL 05B

The author has identified the following significant results. As part of the tape reformatting process, a simple coded picture output program was developed. This represents Pixel's radiance level by one of a 47 character set on a nonoverprinting line printer. It not only has aided in locating areas for the reformatting process, but has also formed the foundation for a supervised clustering package. This in turn has led to a simplistic but effective thematic mapping package.

N76-27622*# Helsinki Univ. (Finland). Dept. of Geology.
INVESTIGATION OF LANDSAT IMAGERY ON CORRELATIONS BETWEEN ORE DEPOSITS AND MAJOR SHIELD STRUCTURES IN FINLAND Quarterly Progress Report, Jan. - Mar. 1976
Heikki V. Tuominen, Principal Investigator Mar. 1976 13 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10390; NASA-CR-148204; QPR-3) Avail: NTIS HC $3.50 CSCL 08G

The author has identified the following significant results. Half of the 24 lineaments found in the LANDSAT winter mosaic have not been recorded in earlier literature. Some distinct fracture zones of the basement seem not to be observable as lineaments in the LANDSAT imagery.

N76-27623*# Department of Industry, London (England).
COMPARISONS OF CLOUD COVER EVALUATED FROM LANDSAT IMAGERY AND METEOROLOGICAL STATIONS ACROSS THE BRITISH ISLES Quarterly Report
Eric C. Barrett, Principal Investigator and Colin K. Grant Jun. 1976 47 p refs Sponsored by NASA and Dept. of Industry, London Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10403; NASA-CR-148216; QR-3) Avail: NTIS HC $4.00 CSCL 04B

The author has identified the following significant results. This stage of the study has confirmed the initial supposition that LANDSAT data could be analyzed to provide useful data on cloud amount, and that useful light would be thrown thereby on the performance of the ground observer of this aspect of the state of the sky. This study, in comparison with previous studies of a similar nature using data from meteorological satellites, has benefited greatly from the much higher resolution data provided by LANDSAT. This has permitted consideration of not only the overall performance of the surface observer in estimating total cloud cover, but also his performance under different sky conditions.

N76-27624*# National Research Council, Bangkok (Thailand).
THAILAND NATIONAL PROGRAMME OF THE EARTH RESOURCES TECHNOLOGY SATELLITE Progress Report
Sanga Sabhasri, Principal Investigator May 1976 8 p Sponsored by NASA ERTS
(E76-10404; NASA-CR-148217; G-28080) Avail: NTIS HC $3.50 CSCL 05B

The author has identified the following significant results. The study on locating hill tribe villages from LANDSAT imagery was successful and exceeded the initial expectations. Results of the study on land use and forest mapping using Skylab data demonstrated the capability and feasibility of large scale mapping with high accuracy.

N76-27625*# Texas A&M Univ., College Station. Remote Sensing Center.
APPLIED REGIONAL MONITORING OF THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION IN THE GREAT PLAINS CORRIDOR Progress Report, Feb. - Apr. 1976
John W. Rouse, Jr., Principal Investigator May 1976 22 p refs ERTS
(Contract NAS5-20796)
(E76-10406; NASA-CR-148219; RSC-3018-5) Avail: NTIS HC $3.50 CSCL 08F

The author has identified the following significant results. A TV16 isoline map at the 6.25 million hectare extended test site area in north central Texas and southern Oklahoma was produced. The map was compared to a published USDA Statistical Reporting Service map, which shows pasture and range feed conditions; as reported by rancher respondents. Both maps show similar areas of drought stress and good to excellent forage conditions, but preliminary indications are that the LANDSAT-derived map more accurately depicts the areal extent of each condition class.

N76-27626*# Texas A&M Univ., College Station. Remote Sensing Center.
SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS Progress Report, Mar. - May 1976
Bruce J. Blanchard, Principal Investigator Jun. 1976 8 p ERTS
(Contract NAS5-22534)
(E76-10407; NASA-CR-148214; RSC-3273-3) Avail: NTIS HC $3.50 CSCL 08H
There are no author-identified significant results in this report.

N76-27627*# California State Dept. of Water Resources, Sacramento.
[WATER QUALITY CONDITIONS IN SAN FRANCISCO BAY DELTA] Progress Report
Randall L. Brown, Principal Investigator 9 Jun. 1976 1 p ERTS
(Contract NAS5-20945)
(E76-10408; NASA-CR-148215; PR-4) Avail: NTIS HC $3.50 CSCL 14E
There are no author-identified significant results in this report.

N76-27628*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATION OF EARTH'S ALBEDO USING SKYLAB DATA Final Report
Robert E. Turner, Principal Investigator Jan. 1976 82 p refs EREP
(Contract NAS9-13279)
(E76-10409; NASA-CR-147445; ERIM-102200-20-F) Avail: NTIS HC $5.00 CSCL 04A
The author has identified the following significant results. Specific test sites in the White Sands, New Mexico and Lake Michigan areas were chosen because of their stability and known reflectances. Skylab S192 multispectral data and ERIM aircraft multispectral data were collected for these sites and were compared with results of atmospheric radiative transfer calculations in order to determine the aerosol content of the atmosphere. The spectral shape of the Skylab data compared quite favorably with the nearly simultaneous spectral character of the aircraft data. Although there were difficulties in the calibration of the S192 instrument which remain unresolved, interesting mathematical and physical relationships were discovered.

N76-27629*# Kansas Univ., Lawrence. Remote Sensing Lab.
METHODS FOR CORRECTING MICROWAVE SCATTERING AND EMISSION MEASUREMENTS FOR ATMOSPHERIC EFFECTS
Mark Komen, Principal Investigator Aug. 1975 32 p refs EREP
(Contract NAS9-13642)
(E76-10412; NASA-CR-147781; CRES-254-6) Avail: NTIS HC $4.00 CSCL 20N
The author has identified the following significant results. Algorithms were developed to permit correction of scattering coefficient and brightness temperature for the Skylab S193 Radscat for the effects of cloud attenuation. These algorithms depend upon a measurement of the vertically polarized excess brightness temperature at 50 deg incidence angle. This excess temperature is converted to an equivalent 50 deg attenuation, which may then be used to estimate the horizontally polarized excess brightness temperature and reduced scattering coefficient at 50 deg. For angles other than 50 deg, the correction also requires use of the variation of emissivity with salinity and water temperature.

N76-27630*# South Dakota State Univ., Brookings. Remote Sensing Inst.
SOIL MOISTURE AND EVAPOTRANSPIRATION PREDICTIONS USING SKYLAB DATA Final Report, 1 Mar. 1973 - 30 Sep. 1975
V. I. Myers, Principal Investigator, D. G. Moore, M. L. Horton, and M. J. Russell 30 Sep. 1975 97 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13337)
(E76-10413; NASA-CR-147441; SDSU-RSI-75-09) Avail: NTIS HC $5.00 CSCL 08M
The author has identified the following significant results. Multispectral reflectance and emittance data from the Skylab workshop were evaluated for prediction of evapotranspiration and soil moisture for an irrigated region of southern Texas. Wavelengths greater than 2.1 microns were required to spectrally distinguish between wet and dry fallow surfaces. Thermal data provided a better estimate of soil moisture than did data from the reflective bands. Thermal data were dependent on soil moisture but not on the type of agricultural land use. The emittance map, when used in conjunction with existing models, did provide an estimate of evapotranspiration rates. Surveys of areas of high soil moisture can be accomplished with space altitude thermal data. Thermal data will provide a reliable input into irrigation scheduling.

N76-27631*# Geological Survey, San Juan (Puerto Rico).
THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS Final Report, 31 May 1973 - 15 Oct. 1975
James V. A. Trumbull, Principal Investigator 15 Oct. 1975 133 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(NASA Order T-4658-B)
(E76-10414; NASA-CR-147437) Avail: NTIS HC $6.00 CSCL 08J
The author has identified the following significant results. Three Skylab earth resources passes over Puerto Rico and St. Croix on 6 June and 30 November 1973 and 18 January 1974 resulted in color photography and multispectral photography and scanner imagery. Bathymetric and turbid water features are differentiable by use of the multispectral data. Photography allows mapping of coral reefs, offshore sand deposits, areas of coastal erosion, and patterns of sediment transport. Bottom sediment types could not be differentiated. Patterns of bottom dwelling biologic communities are well portrayed but are difficult to differentiate from bathymetric detail. Effluent discharges and oil slicks are readily detected and are differentiated from other phenomena by the persistance of their images into the longer wavelength multispectral bands.

N76-27632*# Instituto Geografico y Catastral, Madrid (Spain).
THEMATIC MAPPING, LAND USE, GEOLOGICAL STRUCTURE AND WATER RESOURCES IN CENTRAL SPAIN Quarterly Report
Nunez DelasCuevas, Principal Investigator 15 May 1976 59 p Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E76-10416; NASA-CR-148280; QR-2) Avail: NTIS HC $4.50 CSCL 08B
There are no author-identified significant results in this report.

N76-27633*# Utah Univ., Salt Lake City. Dept. of Geophysics and Geology.
REMOTE SENSING IN MINERAL EXPLORATION FROM LANDSAT IMAGERY Quarterly Report, Jan. - Mar. 1976
L. H. Lattman, Principal Investigator 28 May 1976 30 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20955)
(E76-10417; NASA-CR-148283; QR-4) Avail: NTIS HC $4.00 CSCL 08I
There are no author-identified significant results in this report.

N76-27634*# ECON, Inc., Princeton, N.J.
A PRELIMINARY STUDY OF THE STATISTICAL ANALYSES AND SAMPLING STRATEGIES ASSOCIATED WITH THE INTEGRATION OF REMOTE SENSING CAPABILITIES INTO

THE CURRENT AGRICULTURAL CROP FORECASTING SYSTEM
Francis Sand and Robert Christie 30 Jun. 1975 90 p refs
(Contract NASw-2558)
(NASA-CR-148154; Rept-75-127-1) Avail: NTIS HC $5.00 CSCL 02B

Extending the crop survey application of remote sensing from small experimental regions to state and national levels requires that a sample of agricultural fields be chosen for remote sensing of crop acreage, and that a statistical estimate be formulated with measurable characteristics. The critical requirements for the success of the application are reviewed in this report. The problem of sampling in the presence of cloud cover is discussed. Integration of remotely sensed information about crops into current agricultural crop forecasting systems is treated on the basis of the USDA multiple frame survey concepts, with an assumed addition of a new frame derived from remote sensing. Evolution of a crop forecasting system which utilizes LANDSAT and future remote sensing systems is projected for the 1975-1990 time frame. Author

N76-27635*# ECON, Inc., Princeton, N.J.
UNITED STATES BENEFITS OF IMPROVED WORLDWIDE WHEAT CROP INFORMATION FROM A LANDSAT SYSTEM Final Report
Klaus P. Heiss, Francis Sand, Andrew Seidel, Dennis Warner, Neil Sheflin, R. Bhattacharyya, and John Andrews 31 Aug. 1975 241 p refs
(Contract NASw-2558)
(NASA-CR-148158; Rept-76-122-1B) Avail: NTIS HC $8.00 CSCL 02B

The value of worldwide information improvements on wheat crops, promised by LANDSAT, is measured in the context of world wheat markets. These benefits are based on current LANDSAT technical goals and assume that information is made available to all (United States and other countries) at the same time. A detailed empirical sample demonstration of the effect of improved information is given; the history of wheat commodity prices for 1971-72 is reconstructed and the price changes from improved vs. historical information are compared. The improved crop forecasting from a LANDSAT system assumed include wheat crop estimates of 90 percent accuracy for each major wheat producing region. Accurate, objective worldwide wheat crop information using space systems may have a very stabilizing influence on world commodity markets, in part making possible the establishment of long-term, stable trade relationships. Author

N76-27636*# ECON, Inc., Princeton, N.J.
A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IRRIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER Final Report
Elliot Wetzler, Francis Sand, Peter Stevenson, and Martin Putnam 30 Aug. 1975 246 p refs
(Contract NASw-2558)
(NASA-CR-148157; Rept-75-127-5) Avail: NTIS HC $8.00 CSCL 08H

A case study analysis is presented of the relationships between improvements in the accuracy, frequency, and timeliness of information used in making hydrological forecasts and economic benefits in the areas of hydropower and irrigation. The area chosen for the case study is the Oroville Dam and Reservoir. Emphasis is placed on the use of timely and accurate mapping of the aerial extent of snow in the basin by earth resources survey systems such as LANDSAT. The subject of benefits resulting from improved runoff forecasts is treated in a generalized way without specifying the source of the improvements. Author

N76-27637*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT US STANDARD CATALOG, 1-31 MARCH 1976
31 Mar. 1976 114 p
(NASA-TM-X-74141; GSFC/LU-76/003;
NTISUB/B/138-76/003) Avail: NTIS HC $5.00 CSCL 05B

The U.S. Standard Catalog lists U.S. imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N76-27638*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT NON-US STANDARD CATALOG, 1-31 MARCH 1976
31 Mar. 1976 117 p
(NASA-TM-X-74140; GSFC/LN-76/003;
NTISUB/B/139-76/003) Avail: NTIS HC $5.50 CSCL 05B

The Non-U.S. Standard Catalog lists Non-U.S. imagery acquired by LANDSAT 1 and LANDSAT 2 which have been processed and input to the data files during the referenced month. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N76-27639*# Texas A&M Univ., College Station. Dept. of Mathematics.
APPLICATIONS OF FEATURE SELECTION Final Report, 1 Jun. 1975 - 31 May 1976
L. F. Guseman, Jr. 31 May 1976 154 p refs
(Contract NAS9-14689)
(NASA-CR-147790) Avail: NTIS HC $6.75 CSCL 05B

The use of satellite-acquired (LANDSAT) multispectral scanner (MSS) data to conduct an inventory of some crop of economic interest such as wheat over a large geographical area is considered in relation to the development of accurate and efficient algorithms for data classification. The dimension of the measurement space and the computational load for a classification algorithm is increased by the use of multitemporal measurements. Feature selection/combination techniques used to reduce the dimensionality of the problem are described. Author

N76-27640*# Kansas Univ. Center for Research, Inc., Lawrence.
THE APPLICATION OF REMOTE SENSING TO RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY PROGRAMS IN KANSAS Annual Report, 1 Apr. 1975 - 31 Mar. 1976
B. G. Barr and E. A. Martinko Jul. 1976 65 p
(Grant NGL-17-004-024)
(NASA-CR-148325) Avail: NTIS HC $4.50 CSCL 05A

Activities of the Kansas Applied Remote Sensing Program (KARS) designed to establish interactions on cooperative projects with decision makers in Kansas agencies in the development and application of remote sensing procedures are reported. Cooperative demonstration projects undertaken with several different agencies involved three principal areas of effort: Wildlife Habitat and Environmental Analysis; Urban and Regional Analysis; Agricultural and Rural Analysis. These projects were designed to concentrate remote sensing concepts and methodologies on existing agency problems to insure the continued relevancy of the program and maximize the possibility for immediate operational use. Completed projects are briefly discussed. Author

N76-27641*# Maryland Univ., Frostburg. Appalachian Environmental Lab.
AN EVALUATION OF THE UTILIZATION OF REMOTE SENSING IN RESOURCE AND ENVIRONMENTAL MANAGEMENT OF THE CHESAPEAKE BAY REGION Final Report, Dec. 1974 - Sep. 1975
Dale B. Fuller, Dan M. Harmon, and Kent B. Fuller Jun. 1976 266 p refs Original contains color illustrations
(Grant NsG-6001)
(NASA-CR-141405) Avail: NTIS HC $9.00 CSCL 05B

A nine-month study was conducted to assess the effectiveness of the NASA Wallops Chesapeake Bay Ecological Program in remote sensing. The study consisted of a follow-up investigation and information analysis of actual cases in which remote sensing was utilized by management and research personnel in the Chesapeake Bay region. The study concludes that the NASA Wallops Chesapeake Bay Ecological Program is effective, both in terms of costs and performance. Author

N76-27642*# Rice Univ., Houston, Tex. Inst. for Computer Sciences and Applications.
PHASE 4 OF THE RICE UNIVERSITY EARTH RESOURCES DATA ANALYSIS PROGRAM Final Report, Jun. 1975 - Jun. 1976
Jun. 1976 16 p refs
(Contract NAS9-12776)

(NASA-CR-147826; ICSA-TR-275-025-FPIV) Avail: NTIS HC $3.50 CSCL 05B

Projects were completed in the development of various pattern recognition algorithms and the development of some general purpose algorithms useful in remote sensing calculations. Author

N76-27643*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
OIL IN THE MOUTHS OF RIVERS
N. I. Markovskiy Washington NASA Jun. 1976 22 p refs Transl. into ENGLISH from Priroda (USSR), no. 2, Feb. 1976 p 100-111
(Contract NASw-2789)
(NASA-TT-F-15462) Avail: NTIS HC $3.50 CSCL 08G

The value of paleogeographic zoning in oil and gas exploration is discussed. The paleogeographic method is applied to oil and gas-bearing regions of Western Siberia to show the correlation between the location of large deposits and the sites of ancient seashores and estuaries. Productive oil and gas-bearing areas can be correlated with ancient deltas in the U.S.A. as well. Promising areas in the rest of the world are outlined. Author

N76-27644*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
SPACE REMOTE SENSING OF THE EARTH LANDSCAPES
A. A. Grigoryev Washington NASA Jul. 1976 282 p refs Transl. into ENGLISH of the book "Kosmicheskaya Indikatsiya Landshaftov Zemli" Leningrad State University, Leningrad, 1975 165 p
(Contract NASw-2789)
(NASA-TT-F-16924) Avail: NTIS HC $9.25 CSCL 08B

The development of space photography has opened new and wide possibilities for the investigation of landscapes which are important for solving reverse meteorological problems and for the development of space geography. A textbook is presented which is based both on original investigations of the author and the experience of Soviet and foreign researchers, and which considers for the first time in a systematized manner the possibilities of the remote space sensing of various types of the earth's underlying surfaces. Various types of space imageries from different regions of the world (i.e., in the United States) are analyzed. The text is designed for people studying questions of remote sensing of the environment and may be used by space ecology specialists, meteorologists, geophysicists, geographers, and cartographers. Photographs and illustrations are shown. Author

N76-27645*# Kanner (Leo) Associates, Redwood City, Calif.
INDICES OF OIL-BEARING DEPOSITS AS BASED ON THE FORMATION WATERS OF POLAND
K. Schoenreich Washington NASA Jun. 1976 9 p Transl. into ENGLISH from Nafta (Katowice), vol. 27, no. 4-6, 1971 p 154-157
(Contract NASw-2790)
(NASA-TT-F-17101) Avail: NTIS HC $3.50 CSCL 08G

The frequency of occurrence of the I2, Cl:Br, SO4 and SO4:HCO3 indices was analyzed in water samples originating from oil-water interfaces and in barren samples originating in the regional hydrochemical background. The subject of the study were all analyses of Polish waters (about 1000) made during oil exploration. The prospective ranges which were determined for the indices were as follows: for I2 > 100 mg/l, for Cl:Br < 120, for SO4 < 0.07 g/l and for SO4:HCO3 < 2. The concept of an oil prospect coefficient was introduced, assigning to the corresponding indices numerical values, characterizing the probability of occurrence of crude oil accummulations. In the prospective ranges, the coefficients are greater than one, and in the unlikely ranges their values lie between zero and one. Author

N76-27646*# Arizona Univ., Tucson. Office of Arid Land Studies.
APPLIED REMOTE SENSING PROGRAM (ARSP) Annual Report
Jack D. Johnson, Kennith E. Foster, David A. Mouat, David A. Miller, and Jeffery S. Conn Jun. 1976 66 p refs
(Grant NGL-03-002-313)
(NASA-CR-148324; OALS-Bull-13) Avail: NTIS HC $4.50 CSCL 08F

The activities and accomplishments of the Applied Remote Sensing Program during FY 1975-1976 are reported. The principal objective of the Applied Remote Sensing Program continues to be designed projects having specific decision-making impacts as a principal goal. These projects are carried out in cooperation and collaboration with local, state and federal agencies whose responsibilities lie with planning, zoning and environmental monitoring and/or assessment in the application of remote sensing techniques. The end result of the projects is the use by the involved agencies of remote sensing techniques in problem solving. Author

N76-27647*# Joint Publications Research Service, Arlington, Va.
METHODS FOR SURVEYING TO DETERMINE THE IMPORTANCE OF FORESTS IN WATERSHEDS USING SATELLITE IMAGERY
Chamni Bunyaphat, Buchana Klankhamson, and Thongchai Charuphaphat Washington NASA Jul. 1976 19 p Transl. into ENGLISH from Forest Management Div. Forestry Dept. (Bangkok), 1975 p 1-18
(NASA Order W-13183)
(NASA-TT-F-17064) Avail: NTIS HC $3.50 CSCL 02F

Surveys of some of the river valleys in northern Thailand were initiated for the following reasons: (1) to determine the level of importance of forests in various river valleys, (2) to determine an advantageous use of the land in each category of importance, (3) to aid in the control of land use in these areas, and (4) to monitor land use in these areas. Multispectral scanner and return beam vidicon data obtained by the LANDSAT satellites and Skylab were utilized. Detailed instructions are given for image interpretation. D.M.L.

N76-27648*# Joint Publications Research Service, Arlington, Va.
SPACECRAFT INVESTIGATE NATURAL RESOURCES
V. S. Agalakov and A. Sh. Sire Washington NASA Jul. 1976 56 p refs Transl. into ENGLISH of the mono. "Novoye v Zhizni, Nauka, Tekhnike, Seriya Nauka o Zemle, No. 4: Kosmicheskiye Apparaty Issleduyut Prirodnyye Resursy" Moscow, Znaniye Press, 1976 p 1-48
(NASA Order W-13183)
(NASA-TT-F-17077) Avail: NTIS HC $4.50 CSCL 08F

The principles, equipment, and problems of using satellites to study the environment and the earth's natural resources are discussed. Various examples of using satellite data to study natural resources are given. Author

N76-27649*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DIGITIZING ZONE MAPS, USING MODIFIED LARSYS PROGRAM
L. Giddings and S. Boston May 1976 175 p refs
(Contract NAS9-12200)
(NASA-CR-147803; LEC-7498; JSC-10757) Avail: NTIS HC $6.75 CSCL 08B

A method for digitizing zone maps is presented, starting with colored images and producing a final one-channel digitized tape. This method automates the work previously done interactively on the Image-100 and Data Analysis System computers of the Johnson Space Center (JSC) Earth Observations Division (EOD). A color-coded map was digitized through color filters on a scanner to form a digital tape in LARSYS-2 or JSC Universal format. The taped image was classified by the EOD LARSYS program on the basis of training fields included in the image. Numerical values were assigned to all pixels in a given class, and the resulting coded zone map was written on a LARSYS or Universal tape. A unique spatial filter option permitted zones to be made homogeneous and edges of zones to be abrupt transitions from one zone to the next. A zoom option allowed the output image to have arbitrary dimensions in terms of number of lines and number of samples on a line. Printouts of the computer program are given and the images that were digitized are shown. Author

N76-27650*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
AN EIGHT-NEIGHBOR FILTER FOR LARSYS
S. Boston and L. Giddings May 1976 46 p refs

(Contract NAS9-12200)
(NASA-CR-147802; LEC-7619; JSC-10795) Avail: NTIS HC $4.00 CSCL 08B

An eight-neighbor filter was developed for the LARSYS program. It is used in cleaning zones and sharpening boundaries during the digitization of hand-painted zone maps, in making computer-based vegetation zones more homogeneous, and in classification of natural images, such as LANDSAT or other multispectral imagery. Author

N76-27651*# Scientific Translation Service, Santa Barbara, Calif.
STUDY OF WATER RESOURCES WITH THE AID OF SPACECRAFT IN THE UNITED STATES
L. V. Dunin-Barkovskiy Washington NASA Jul. 1976 18 p refs Transl. into ENGLISH from Vod. Resursy (USSR), no. 1, 1976 p 60-68
(Contract NASw-2791)
(NASA-TT-F-17112) Avail: NTIS HC $3.50 CSCL 08H

Results of research using remote sensing for studying water resources in the United States are examined. Manned and artificial earth satellites are used. Author

N76-27652*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF FIELD SIZE DISTRIBUTIONS, LACIE TEST SITES 5029, 5033, AND 5039, ANHWEI PROVINCE, PEOPLE'S REPUBLIC OF CHINA
Melvin H. Podwysocki Jun. 1976 12 p ref Submitted for publication
(NASA-TM-X-71156; X-923-76-145) Avail: NTIS HC $3.50 CSCL 08B

A study was made of the field size distributions for LACIE test sites 5029, 5033, and 5039, People's Republic of China. Field lengths and widths were measured from LANDSAT imagery, and field area was statistically modeled. Field size parameters have log-normal or Poisson frequency distributions. These were normalized to the Gaussian distribution and theoretical population curves were made. When compared to fields in other areas of the same country measured in the previous study, field lengths and widths in the three LACIE test sites were 2 to 3 times smaller and areas were smaller by an order of magnitude.
Author

N76-27653*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUANTIZATION AND SYMMETRY IN PERIODIC COVERAGE PATTERNS WITH APPLICATIONS TO EARTH OBSERVATION
Joseph C. King Dec. 1975 11 p refs Presented at the AAS/AIAA Astrodynamics Specialist Conf., Nassau, Bahamas, 28-30 Jul. 1975
(NASA-TM-X-71155) Avail: NTIS HC $3.50 CSCL 08B

Analytical approaches based on an idealized physical model and concepts from number theory show that in periodic coverage patterns, uniquely defined by their revolution numbers R (orbital) and N (rotational), the subnodal points are earth-fixed, and they divide the equator into R equal segments of length s. The ascending subsatellite trace crosses each point once (only) each period. The descending subnodal points coincide with the ascending points if the integers N and R have like parity, and bisect the intervals between them if opposite. The interval between consecutive unidirectional crossings is Ns. Symmetries extend the equatorial results to all parallels of latitude. Complete periodic patterns of traces exhibit an overall symmetry, with trace intersections confined to discrete coordinate values which are quantized in longitude (basic s-unit) and symmetric in latitude. Author

N76-27654*# Bittinger (M. W.) and Associates, Inc., Fort Collins, Colo.
SOIL-MOISTURE GROUND TRUTH, HAND COUNTY, SOUTH DAKOTA
E. Bruce Jones Apr. 1976 53 p ref
(Contract NAS5-22312)
(NASA-CR-144781) Avail: NTIS HC $4.50 CSCL 08M

Soil types were determined from the Soil Survey of Hand County, South Dakota. The soil types encountered on the soil moisture lines are summarized. The actual soil moisture data are presented. The data have been divided by range, township and section. The soil moisture data obtained in fields of winter wheat and spring wheat are briefly summarized. Author

N76-27655# Oak Ridge National Lab., Tenn.
ASSIGNMENTS OF ERTS AND TOPOGRAPHICAL DATA TO GEODETIC GRIDS FOR ENVIRONMENTAL ANALYSIS OF CONTOUR STRIP MINING
R. C. Durfee and R. G. Edwards 1975 55 p refs Presented at the Intern. Symp. on Land Use, Phoenix, Ariz., 27 Oct. 1975 Sponsored by ERDA
(Conf-751074-1) Avail: NTIS HC $5.50

Computer techniques are presented for converting ERTS classified landcover patterns, Defense Mapping Agency topographic data, and geographical variables from other sources onto a common geodetic grid composed of latitude-longitude cells. Spatial analysis techniques are then used to assess the environmental and aesthetic impact of coal surface mining in the New River basin of East Tennessee. Author (ERA)

N76-27656# Royal Netherlands Meteorological Inst., De Bilt.
NIGHT FROST. ORIGIN OF THE PHENOMENON AND MEANS AND METHODS TO PREVENT OR LIMIT DAMAGE [NACHTVORST. ONTSTAAN VAN HET VERSCHIJNSEL EN MIDDELEN EN METHODEN OM SCHADE TE VOORKOMEN OF TE BEPERKEN]
M. Scharringa [1976] 104 p refs In DUTCH
(VO-5) Avail: NTIS HC $5.50; Staatsdrukkerij Gerard Bouwman DFl 9,85

The physical processes resulting in night frost are described. Night frost is the meteorological situation in which the air temperature and the temperature of protruding objects near the earth's surface descend below freezing point at night but rise above this during daytime. In agriculture night frost is of importance mainly in the growth season. Methods and means to limit or prevent damage are dealt with. These include passive methods such as choice of the land, and choice of the growth season, and active methods such as glass, plastic or metal covers, and watering. ESA

N76-27657# Texas Highway Dept., Austin. Div. of Automation.
NUMERICAL GROUND IMAGE SYSTEM
William L. Crawford and Roy R. Guess Oct. 1974 152 p Prepared in cooperation with Federal Highway Admin., Washington, D. C.
(PB-249512/5; THD-1-19-71-186-2F) Avail: NTIS HC $6.75 CSCL 08B

This report (1) explains computer methods for representing a terrain surface using a numerical surface and (2) provides user instructions for data retrieval of cross-sections computed from this surface model. The appendix contains an example problem, a detailed explanation of the algorithms used, and the program documentation for the Numerical Ground Image system. GRA

N76-27658# Los Angeles County Sanitation District, Whittier, Calif.
DEMINERALIZATION OF WASTEWATER BY ELECTRODIALYSIS Final Report, Jul.-Dec. 1970
Harold H. Takenaka (EPA, San Francisco), Ching-lin Chen, and Robert P. Miele Cincinnati SPA Oct. 1975 44 p
(Contract EPA-14-12-150)
(PB-249102/5; EPA-600/2-75-047) Avail: NTIS HC $4.00 CSCL 07A

Demineralization of carbon-treated secondary effluent by a 45.5 1 pm (12 gpm) Ionics electrodialysis pilot plant was investigated at the Pomona Advanced Wastewater Treatment Research Facility, Pomona, California. Slime formation (organic fouling) on the membranes and spacers of the electrodialysis stack during continuous operation significantly decreased the effectiveness of the electrodialysis process to demineralize municipal wastewater. If the total COD of the feedwater was maintained at or below 10 mg/l, a weekly enzyme-detergent flush maintained the total dissolved solids (TDS) removal in the design range of 30-35 percent. A cost estimate for a 10 MGD single stage electrodialysis plant based on the operating results obtained at Pomona was made. The estimated cost of 19.4 cents

per 1,000 gallons was based on the use of carbon-treated secondary effluent with an average TDS concentration of 540 mg/l and a total COD of 10 mg/l or less to produce a product water with 30-35 percent reduction in TDS. GRA

N76-27659# Little (Arthur D.), Inc., Cambridge, Mass.
ECONOMIC FEASIBILITY OF RECOVERING AND UTILIZING METHANE EMITTED FROM COAL Open File Report, 1973-1975
15 Apr. 1975 241 p refs
(Contract DI-BM-HO-230035)
(PB-249728/7; ADL-C-76035; BM-OFR-18-76) Avail: NTIS HC $8.00 CSCL 08I

It has been recognized for many years that the methane in coal would have some value if it could be recovered and used. Also its removal before coal mining began or during the mining cycle itself would make mining safer and more economic due to a potential saving in ventilation costs. The work covered in this report was carried out to review methods of removing methane from active and inactive regions of operating coal mines and to determine how the methane could be concentrated and utilized economically. Potential markets for use of methane produced, and an assessment of the opportunities for economic use were considered. GRA

N76-27660# Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
WINTER-REGIME THERMAL RESPONSE OF HEATED STREAMS Ph.D. Thesis
Poothrikka P. Paily May 1974 203 p refs
(OWRT Proj. B-018-IA(4))
(PB-249890/5; W76-04673) Avail: NTIS HC $7.75 CSCL 13B

A one-dimensional convection-diffusion equation was solved to predict the winter-time temperature distributions and lengths of ice-free reaches in natural streams subjected to artificial thermal inputs. It was shown that the surface heat exchange between water and atmosphere could be expressed, for most practical purposes, as a linear function of the water temperature. The coefficients of the linearized heat loss model applicable to laboratory conditions were developed from experiments conducted at subzero air temperatures. For determining the heat loss coefficients for field conditions, relations were developed, describing the coefficients in terms of the meteorological parameters. GRA

N76-27661# Houston Research, Inc., Tex.
DISTILLATION PLANT DATA BOOK Special Report No. 38
A. E. Dukler, L. C. Elliott, and A. L. Farber Jan. 1971 185 p refs
(Contract DI-14-01-0001-2099)
(PB-248978/9; W71-13475) Avail: NTIS HC $7.50 CSCL 07A

A discussion of the more important parameters required for the design or evaluation of VTE and MSF distillation plants is provided. It is directed primarily toward individuals in the desalting industry including the design engineer, the operating engineer and the owner. Major sections of the book are Glossary, Process Design of Multistage Flash Evaporators, Process Design of Vertical Tube Evaporators, Process Design Common to Both Evaporative Processes, Sea Water Pretreatment, Mechanical Design and Material Selection, and Physical Property Data. GRA

N76-27662# Florida Univ., Gainesville.
A HYDROLOGIC STUDY OF A SMALL SUBURBAN WATERSHED
M. W. Anderson and B. E. Ross Oct. 1975 96 p refs Prepared in cooperation with Univ. of South Florida, Tampa
(Contract DI-14-31-0001-5009)
(PB-249744/4; WRRC-Pub-31) Avail: NTIS HC $5.00 CSCL 08H

A 126 acre tract of land in a natural undisturbed state, and adjacent 239.3 acres that made up the watershed, were instrumented in November, 1971, in order to determine the effect of development on the hydrology. Hydrologic quantity and quality data were collected until April, 1975. The tract, which is located in Tampa, Florida, did not experience the planned extensive development due to financial problems of the developer. Consequently, the anticipated major hydrologic changes did not occur. However, significant alterations to the natural drainage pattern of the property were made and these caused changes in the runoff quality which were documented. Data were obtained pertaining to: (1) the changes in runoff quality during a storm, (2) the yearly variation of runoff quality from a partially developed watershed, (3) the lack of change in quality of ground water in the surface aquifer, and (4) the purification of urban runoff by routing it over a natural vegetative system. The study confirmed that disturbing marshes or lakes cause a significant increase in suspended solids and nutrient content in runoff, especially phosphates. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N76-27663 Wisconsin Univ., Madison.
UTILIZATION OF LOW-TEMPERATURE HEAT FROM STEAM-ELECTRIC POWER PLANTS: TECHNIQUES, ECONOMICS, AND INSTITUTIONAL ISSUES Ph.D. Thesis
Samuel Harlan Nelson 1975 316 p
Avail: Univ. Microfilms Order No. 76-2499

Utilization of condenser waste water and extracted steam from electric power plants, particularly by industry, was studied. The economic theory of joint production was applied considering only condenser water and extracted steam as alternatives to electricity generation. An economic and energy model was developed based upon comparison of a joint plant with its most likely alternative, a single purpose electric plant and an industrial process steam plant. The model was designed to evaluate cost savings resulting from joint production. The model was tested in various simulations, revealing that there are large economic benefits from joint production, both in the initial operating year and over the plant lifetime. Coal versus nuclear generating costs were also evaluated. Specific case studies were then conducted and a set of conditions required for successful provision of process steam to industry were developed. Dissert. Abstr.

N76-27664* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LEAD-OXYGEN dc POWER SUPPLY SYSTEM HAVING A CLOSED LOOP OXYGEN AND WATER SYSTEM Patent
William J. Britz, William A. Bosher, and James J. Kaufmann, inventors (to NASA) Issued 22 Jun. 1976 6 p Filed 27 Dec. 1974 Supersedes N75-16078 (13 - 07, p 0789)
(NASA-Case-MFS-23059-1; US-Patent-3,964,928; US-Patent-Appl-SN-537024; US-Patent-Class-136-86A) Avail: US Patent Office CSCL 10B

An electrical power system is provided for supplying dc power to electrically motorized vehicles, emergency standby sources, and the like. A lead-oxygen battery cell used as a source of dc power includes a positive charging grid, a conventional negative electrode, a positive discharging electrode, and a Teflon membrane member coated with a catalyst contained in an atmosphere of oxygen which is admitted to the cell through the Teflon membrane. Oxygen is given off during the charging cycle and is compressed in a storage tank for reuse during each duty cycle providing a closed system wherein contamination is minimized and a long-life cycle can result.
Official Gazette of the U.S. Patent Office

N76-27665*# Motorola, Inc., Phoenix, Ariz. Semiconductor Group.
LASER-ZONE GROWTH IN A RIBBON-TO-RIBBON (RTR) PROCESS, SILICON SHEET GROWTH DEVELOPMENT FOR

THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SILICON SOLAR ARRAY PROJECT Technical Quarterly Report No. 1

R. W. Gurtler and A. Baghdadi Mar. 1976 53 p Sponsored in part by NASA and ERDA Prepared for JPL
(Contract JPL-954376)
(NASA-CR-148316; TQR-1; Motorola-2256/1;
ERDA/JPL-954376-76/1) Avail: NTIS HC $4.50 CSCL 10A

The objective of this research is to fully investigate the Ribbon-To-Ribbon (R-T-R) approach to silicon ribbon growth. Initial work has concentrated on modification and characterization of an existing R-T-R apparatus. In addition, equipment for auxiliary heating of the melt is being evaluated and acquired. Modification of the remote viewing system and mechanical staging are nearly complete. Characterization of the laser and other components is in progress and several auxiliary heating techniques are being investigated. Author

N76-27666*# RCA Labs., Princeton, N.J.

AUTOMATED ARRAY ASSEMBLY Quarterly Report, Feb. - Mar. 1976

B. F. Williams Mar. 1976 42 p refs Sponsored in part by ERDA
(Contracts NAS7-100; JPL-954352)
(NASA-CR-148162; QR-1; PRRL-76-CR-18;
ERDA/JPL-954352-76/1) Avail: NTIS HC $4.00 CSCL 10A

Manufacturing techniques are evaluated using expenses based on experience and studying basic cost factors for each step to evaluate expenses from a first-principles point of view. A formal cost accounting procedure is developed which is used throughout the study for cost comparisons. The first test of this procedure is a comparison of its predicted costs for array module manufacturing with costs from a study which is based on experience factors. A manufacturing cost estimate for array modules of $10/W is based on present-day manufacturing techniques, expenses, and materials costs. Author

N76-27667*# Energy Research Corp., Danbury, Conn.

INVESTIGATION OF METAL HYDRIDE MATERIALS AS HYDROGEN RESERVOIRS FOR METAL-HYDROGEN BATTERIES

Onischak 30 Jun. 1976 50 p refs
(Contract NAS3-18543)
(NASA-CR-135031) Avail: NTIS HC $4.00 CSCL 10C

The performance and suitability of various metal hydride materials were examined for use as possible hydrogen storage reservoirs for secondary metal-hydrogen batteries. Lanthanum pentanickel hydride appears as a probable candidate in terms of stable hydrogen supply under feasible thermal conditions. A kinetic model describing the decomposition rate data of the hydride has been developed. Author

N76-27668# Committee on Agriculture (U. S. House).

ENERGY REQUIREMENTS FOR FOOD AND FIBER

Washington GPO 1975 134 p refs Hearings before Subcomm. on Dept. Operations, Investigations and Oversight of Comm. on Agriculture, 94th Congr., 1st Sess., 17-18 Mar. 1975
(GPO-53-376) Avail: Subcomm. on Dept. Operations, Investigations and Oversight

Energy consumption for agriculture and related activities is considered. The provision of supplies for farms, farm production, processing, storage, distribution, marketing, and consumption are included. D.M.L.

N76-27669# Committee on Commerce (U. S. Senate).

NATURAL GAS PRODUCTION AND CONSERVATION ACT OF 1975

Washington GPO 1975 464 p refs Hearings before Comm. on Commerce, 94th Congr., 1st Sess., 17-18 Mar. 1975
(GPO-49-766) Avail: Comm. on Commerce

A bill is proposed which is designed to improve natural gas supplies while controlling inflation in natural gas prices. Price ceilings would be established with allowances for reasonable increases due to inflation or unusual circumstances. Producers on Federal lands would be required to develop and produce natural gas as soon as practicable. The bill would also ensure supplies to high priority users by prohibiting the use of natural gas when other fuels are satisfactory. Information regarding natural gas would also be made more available to the FPC and the public. D.M.L.

N76-27670# Committee on Science and Astronautics (U. S. House).

SECONDARY AND TERTIARY RECOVERY OF OIL

Joseph P. Riva, Jr. Washington GPO 1974 62 p refs Rept. for Subcomm. on Energy of Comm. on Sci. and Astron., 93d Congr., 2d Sess., Oct. 1974 Prepared by Library of Congr., Sci. Policy Res. Div.
(GPO-40-382) Avail: Subcomm. on Energy

Background information concerning the various oil recovery methods is presented. The geology associated with oil deposits is discussed and estimates of domestic oil reserves are given. Federal oil recovery research and development programs are considered in relation to the relevance of advanced oil recovery technology to the energy crisis. Author

N76-27671*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN INEXPENSIVE ECONOMICAL SOLAR HEATING SYSTEM FOR HOMES

Johnny W. Allred, Joseph M. Shinn, Jr., Cecil E. Kirby, and Sheridan R. Barringer Washington NASA Jul. 1976 59 p refs
(NASA-TM-X-3294; L-10451) Avail: NTIS HC $4.50 CSCL 13B

A low-cost solar home heating system to supplement existing warm-air heating systems is described. The report is written in three parts: (1) a brief background on solar heating, (2) experience with a demonstration system, and (3) information for the homeowner who wishes to construct such a system. Instructions are given for a solar heating installation in which the homeowner supplies all labor necessary to install off-the-shelf components estimated to cost $2,000. These components, which include solar collector, heat exchanger, water pump, storage tank, piping, and controls to make the system completely automatic, are available at local lumber yards, hardware stores, and plumbing supply stores, and are relatively simple to install. Manufacturers and prices of each component used and a rough cost analysis based on these prices are included. This report also gives performance data obtained from a demonstration system which was built and tested at the Langley Research Center. Author

N76-27672# Committee on Interior and Insular Affairs (U. S. Senate).

NATIONAL ENERGY PRODUCTION BOARD, PART 2

Washington GPO 1975 490 p refs Hearings on S. 740 before Comm. on Interior and Insular Affairs, 94th Congr., 1st Sess., 14 and 21 Jul. 1975
(GPO-57-639) Avail: Comm. on Interior and Insular Affairs

Legislation is presented which would establish a National Energy Production Board to assure early development of energy resources on the public domain and other Federal lands (i.e. Naval Petroleum Reserves) and on the outer continental shelf in order to overcome the dependence of the United States on foreign nations for energy supplies which are essential to national security, commerce, and a full-employment economy. The development of domestic fossil fuels is examined. The role of government and industry in the development of domestic oil and natural gas is discussed. Federal budgets are outlined which would be used in the development of energy resources. Also considered is the development of coal resources and coal-fired electric power plants. J.R.T.

N76-27673*# Yardney Electric Corp., Pawcatuck, Conn.

FABRICATION AND TESTING OF SEALED SILVER-ZINC CELLS Final Report

C. Philip Donnel, III Jun. 1976 61 p
(Contract NAS3-16805)
(NASA-CR-135048) Avail: NTIS HC $5.00 CSCL 10C

A number of Type HS40-7 sealed silver-zinc cells and experimental 40AH sealed silver-zinc cells were fabricated. Cells of each experimental group contained one variation from the standard configuration (HS40-7) cell. Cells from each of five experimental cell groups and cells of the standard configuration were tested to characterize voltage and capacity performance at various discharge rates. The test cells were then subjected to

100 percent DOD Cycle Life Testing at 22 C. Results indicate that material and/or process variations are available which will improve both performance and cycle life of the existing 40 ampere-hour sealed silver-zinc cell configurations. The average cycle life to 50 percent loss of nominal capacity in cells from two (2) of the experimental groups was 150 - 165 cycles. A series of 12 ampere-hour cells was fabricated and tested as part of a program to incorporate the 40AH sealed silver-zinc cell fabrication technology into a cell of smaller size. Base-line configuration cells and experimental variations were produced using the HS40-7 cell fabrication and processing methods adapted to the smaller cell size. Author

N76-27674# Institute for Energy Analysis, Oak Ridge, Tenn.
NET ENERGY FROM NUCLEAR POWER
R. M. Rotty, A. M. Perry, and D. B. Reister Nov. 1975 133 p refs
(IEA-75-3) Avail: NTIS HC $6.00

The energy requirements as they relate to reactor type, concentration of uranium in the ore, enrichment tails assays, and possible recycle of uranium and plutonium were examined. Specifically, four reactor types were considered: pressurized water reactor, boiling water reactor, high temperature gas-cooled reactor, and heavy water reactor (CANDU). The energy requirements of systems employing both conventional (current) ores with uranium concentration of 0.176 percent and Chattanooga Shales with uranium concentration of 0.006 percent were determined. Data were given for no recycle, uranium recycle only, and uranium plus plutonium recycle. Starting with the energy requirements in the mining process and continuing through fuel reprocessing and waste storage, an evaluation of both electrical energy requirements and thermal energy requirements of each process was made. Author (NSA)

N76-27675# Brookhaven National Lab., Upton, N.Y.
ENERGY SYSTEMS ANALYSIS AND TECHNOLOGY ASSESSMENT PROGRAM Annual Report, fiscal year 1975
M. Beller, ed. Sep. 1975 136 p refs Sponsored by ERDA
(BNL-20501) Avail: NTIS HC $5.45

A base year (1972) Reference Energy System (RES) was developed and RES's were projected for 1980, 1985, 1990, 2000, and 2020. These systems are based primarily upon existing technologies, and future energy systems were developed that incorporate new technologies. An optimization model (BESOM) is used for more extensive analyses, encompassing the entire energy system and reflecting the full feasible range of interfuel substitutability. Technical, economic, and environmental characteristics are considered. A Reference Material Systems (RMS) was also initiated to provide a framework for analysis of substitution of materials and related factors. An interfuel substitution study was completed that evaluated an intensive electrification strategy based on the use of coal and nuclear power. Technical assistance was provided in the following areas: scenarios for 1985 and 2000 were prepared for use in an R and D budget plan; Swedish energy use was studied and net energy concept was outlined. ERA

N76-27676# Brookhaven National Lab., Upton, N.Y. Engineering and Systems Div.
CONSERVATION AS A MAJOR ALTERNATIVE
K. C. Hoffman Oct. 1975 13 p refs Presented at the AT. Ind. Forum Workshop on the Nuclear Debate: Basic issues for 1976, Boston, 27-30 Oct., 1975 Sponsored by ERDA
(BNL-20566; Conf-751055-2) Avail: NTIS HC $4.50

Conservation is frequently viewed as an alternative to specific energy supply options such as nuclear power. Although it is not really a direct alternative to nuclear power, a strong conservation movement may reduce the level to which any specific supply options must be developed at a given future point in time. There are several important components to a conservation strategy, each of which may have different effects on the level of base load electric capacity, the prime market for nuclear power; these components are: (1) conservation of all energy forms; (2) conservation of scarce energy resources (oil and gas); and (3) conservation of power in the electric sector (by increasing the system load factor). With a general reduction of energy demands from all sources it is clear that less reliance need by placed on specific sources such as nuclear. There are also strong incentives, however, to place special emphasis on the conservation of scare resources and on the improvement of electric laod factors to conserve power. In these instances, there is an increased need for base-load electric generating facilities. Author (ERA)

N76-27677# Battelle Pacific Northwest Labs., Richland, Wash.
USER MANUAL FOR GEOCOST: A COMPUTER MODEL FOR GEOTHERMAL COST ANALYSIS. VOLUME 1: STEAM CYCLE VERSION
H. D. Huber, C. H. Bloomster, and R. A. Walter Nov. 1975 145 p refs
(Contract E(45-1)-1830)
(BNWL-1942-Vol-1) Avail: NTIS HC $7.00

A computer model called GEOCOST has been developed at Battelle, Pacific Northwest Laboratories, to rapidly and systematically calculate the potential costs of geothermal power. GEOCOST combines both technical processes and economic factors into one systematic framework and provides the flexibility to individually or collectively evaluate their economic impacts. The version of GEOCOST in this report simulates the production of electricity using a steam power conversion cycle based upon either a dry steam or hydrothermal resource. Future extensions to the model will simulate the production of electricity using other power conversion technologies, including binary fluid cycles, combined binary fluid cycles and steam, and the total flow concept. Author (ERA)

N76-27678# Battelle Pacific Northwest Labs., Richland, Wash.
TECHNOLOGY IN THE FUTURE: ENERGY
L. C. Schmid 1975 6 p Conf. held in Richland, Washington, 8 Oct. 1974
(Contract E(45-1)-1830)
(BNWL-SA-5565; Conf-7410142-1) Avail: NTIS HC $4.50

In creating long term solutions to the energy problem facing the U.S., the basic facts to consider are: (1) U.S. energy consumption is large and increasing rapidly, (2) less costly fuel supplies are running out, and (3) concern is growing for the social and environmental impact of energy generation, conversion, transportation and use. These factors are beginning to result in: (1) energy shortages, (2) increased costs, (3) growing dependence on foreign supplies, and (4) consideration of social and environmental aspects of energy production, as well as technical and economic ones. Independence of foreign oil and natural gas can be increased by conservation efforts, developing domestic supplies of oil and gas, and using more coal and uranium. For the longer term, renewable resources such as solar, geothermal, and fusion must be developed. World energy consumption, U.S. consumption, and consumption in the Pacific Northwest for 1970 were compared. ERA

N76-27679# Argonne National Lab., Ill.
HIGH-PERFORMANCE BATTERIES FOR OFF-PEAK ENERGY STORAGE Progress Report, Jul. - Dec. 1973
P. A. Nelson, W. J. Walsh, R. K. Steunenberg, J. E. Battles, H. Shimotake, N. P. Yao, H. C. Tsai, A. E. Martin, D. R. Vissers, J. R. Birk et al Nov. 1974 43 p refs
(Contract W-31-109-eng-38)
(ANL-8057) Avail: NTIS HC $5.45

Development of high-specific-energy lithium/sulfur batteries for off-peak energy storage in electric utility networks is reported. The cells have negative electrodes of solid lithium--aluminum alloy, positive electrodes of iron sulfide (FeS2 or FeS), with an electrolyte of molten LiCl--KCl eutectic (mp, 352 C). The operating temperature of the cells is about 400 C. An engineering-scale (13-cm-dia) cell was operated for 1,390 hr and has attained a specific energy of 121 W-hr/kg. The use of iron sulfide positive electrodes has extended the capacity retention and cycle life of the cells. The major areas of experimental work in the program are design and scale-up of individual sealed cells, development of electrodes, testing of materials of construction and fabrication of cell components, and supporting laboratory studies. Author (ERA)

N76-27680# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Div. of Solar Energy.
INTERIM SOLAR CELL TESTING PROCEDURES FOR TERRESTRIAL APPLICATIONS
H. Brandhorst, J. Hickey, and H. Curtis Jul. 1975 18 p

Sponsored by ERDA
(TID-26871) Avail: NTIS HC $4.50

This report presents an interim draft of procedures for testing solar cells for terrestrial applications that resulted from the terrestrial photovoltaic workshop sessions. A final version of the test procedures manual is planned for the summer of 1976. ERA

N76-27681# Minnesota Univ., Minneapolis.
RESEARCH APPLIED TO SOLAR THERMAL POWER SYSTEMS Progress Report, 1 Jan. - 31 Aug. 1975
E. M. Sparrow, B. P. Gupta, and G. K. Wehner 30 Sep. 1975 167 p refs Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn. Sponsored in part by ERDA
(Grant NSF GI-34871)
(NSF/RANN/SE/GI-34871/PR-75-2; Rept-6) Avail: NTIS HC $7.75

Experiments were conducted on a scale model parabolic trough collector module in which the heat pipe absorber tube was coated with a non-selective black paint. The collector efficiency was found to be significantly lower than with a selectively coated absorber tube. Second surface aluminum and silver mirrors on Acrylic, Teflon, and glass demonstrated negligible degradation from exposure periods exceeding two years; Auger Electron Spectroscopy and in situ sputtering were used for determining composition versus depth profiles of different solar absorber coatings. Heat pipe tests relating the effect of inclination angle and materials compatibility were performed. An experimental boiler/heat exchanger was operated and the stream and feedwater flow rates were measured as well as the pressure and temperature in the boiler. Thermal conductivity measurements of insulating materials were also performed. The heat transfer characteristics of phase-change heat storage media were calculated, and experience was obtained with a single-phase (water) heat storage system. Author (ERA)

N76-27682# Hawaii Univ., Honolulu. Inst. of Geophysics.
GEOELECTRIC-GEOTHERMAL EXPLORATION ON HAWAII ISLAND: PRELIMINARY RESULTS
D. P. Klein and J. P. Kauahikaua Jan. 1975 33 p refs Sponsored by ERDA
(HIG-75-6) Avail: NTIS HC $4.50

Geoelectric reconnaissance surveys were performed on Hawaii Island to locate areas of low resistivity that might have the potential for commercial geothermal development. The lower northeast end of the Kilauea East Rift Zone has low resistivities (less than 10 ohm-m) that indicate anomalous geothermal conditions. Preliminary results of both ac and dc resistivity surveys indicate that the most promising zone of high temperature waters is at depths of 500 to 1,500 meters beneath the 1955 eruptive vents in this region. The temperature in this zone may be as great as 200 C. Further analysis is continuing on the data and additional data are being gathered to attempt to outline the probable extent of the material with low resistivity. Author (ERA)

N76-27683# Energy Research and Development Administration, Washington, D.C. Div. of Solar Energy.
CATALOG ON SOLAR ENERGY HEATING AND COOLING PRODUCTS
Oct. 1975 445 p refs
(ERDA-75) Avail: NTIS HC $12.75

A quick reference to products that are specifically designed for use in conversion or control of solar energy into useful energy for domestic water heating, space heating, space heating and cooling and industrial process heat. Intended for use by manufacturers of components and subsystems to identify each other for the purpose of offering systems; by architectural and engineering firms to select products; and by users and owners to locate products. The contents are restricted to those products that are currently being manufactured or are in advanced stages of development leading to near term manufacturing within the United States. ERA

N76-27684# Energy Research and Development Administration, Bartlesville, Okla. Energy Research Center.
DIESEL FUEL OILS, 1975
E. M. Shelton Nov. 1975 40 p refs
(BERC/PPS-75/3) Avail: NTIS HC $4.00

The analyses of the fuels are listed in tables for four groups according to type of diesel fuel. Each group of analyses is subdivided into five tabulations according to five general regions of the country where the fuels are marketed. The regions, containing a total of 16 districts, are shown on a map. A total of 13 laboratory tests are listed and arranged by geographic marketing districts in decreasing order of sales volumes. Charts are included showing trends of averages of certain properties for the four types of diesel fuels for the years 1960 to 1975. Summaries of the results of the 1975 survey, compared with similar data for 1974, are shown. Author (ERA)

N76-27685# Energy Research and Development Administration, Washington, D.C. Div. of Solar Energy.
FEDERAL WIND ENERGY PROGRAM, SUMMARY REPORT
Oct. 1975 83 p
(ERDA-84) Avail: NTIS HC $5.45

This paper presents a brief overview of the federal research and development activities in the field of wind energy and includes abstracts of the individual projects which comprise the program. Author (ERA)

N76-27686# Dow Chemical Co., Midland, Mich.
SOLAR ENERGY SUBSYSTEMS EMPLOYING ISOTHERMAL HEAT SINK MATERIALS Semiannual Progress Report, 18 Sep. 1974 - 31 Jun. 1975
G. A. Lane, J. S. Best, E. C. Clarke, S. S. Drake, D. N. Glew, S. W. Quigley, and H. E. Rossow Jul. 1975 25 p refs Supported in part by ERDA
(Contract NSF C-906)
(TID-26907) Avail: NTIS HC $4.50

A group of over 200 potential phase change heat storage materials, melting from 10 to 90 C was identified. Laboratory tests narrowed these to materials recommended for hot faucet water, hydronic heating, forced air heating, heat pump application, radiant wall panels, and stored cold systems. Several encapsulation methods were studied: micro-encapsulation, encapsulation of powders and granules, and macro-encapsulation. Micro-encapsulation of $CaCl_2 \cdot GH_2O$ in polyester resin has been successful, and development of wall, floor, and ceiling panels is under way. Macro-encapsulation in plastic film containers appears promising for hot air systems. Author (ERA)

N76-27687# California Univ., Livermore. Lawrence Livermore Lab.
GEOTHERMAL BINARY FLUID CYCLE: HEAT EXCHANGER AREA REQUIREMENTS AND INITIAL COSTS
W. H. Giedt 23 Sep. 1975 27 p refs
(Contract W-7405-eng-48)
(UCRL-51912) Avail: NTIS HC $4.50

The basic elements of a geothermal binary-fluid energy-conversion cycle are reviewed and the possible different sequences of states of the secondary or working fluid are discussed. The most efficient sequence, thermodynamically, is shown to be when this fluid remains in the compressed liquid and supercritical states during heating and expands to a saturated vapor during the work output process. Such a cycle is independent of the particular working fluid used and can be considered an upper bound of the performance that can be achieved with a specified brine inlet temperature. System performance is then only a function of the temperatures of the brine and working fluid leaving the exchanger. Assuming the use of a counterflow heat exchanger, with the working fluid following the supercritical cycle described, determining the optimum operating condition for the system is shown to require combined consideration of the heat-exchanger and energy-conversion-cycle performances. Author (ERA)

N76-27688# California Univ., Livermore. Lawrence Livermore Lab.
GEOTHERMAL PROJECT DESCRIPTION: LLL EXPERIMENTAL SITE SALTON SEA GEOTHERMAL FIELD
T. D. Palmer and D. F. Towse 7 Nov. 1975 17 p refs
(Contract W-7405-eng-48)
(UCID-16951) Avail: NTIS HC $4.00

The Lawrence Livermore Laboratory program for geothermal research requires the development of a field experimental facility in order to conduct a series of tests on turbine prototypes and

to analyze the system requirements for power conversion. This report gives a description of the field portion of this experimental program including site development, test activities, and project administration. Additionally, it discusses plans for concurrent field environmental studies and surveillance programs. A series of maps are included to describe land ownership and lease status within the area of interest. Successful completion of the test program will prove the technology necessary for commercial development. An assessment of environmental factors indicates few temporary and no long term adverse environmental effects from this program. Author (ERA)

N76-27689# Sandia Labs., Albuquerque, N.Mex.
SANDIA MAGMA ENERGY RESEARCH PROJECT
J. L. Colp 1975 25 p refs Presented at the 2d United Nations Symp. on the Develop. and Uses of Geothermal Resources, San Francisco, 20-29 May 1975
(SAND-75-5492; Conf-750525-3) Avail: NTIS HC $4.25

The objective of this project is to perform the basic research and development studies needed to locate and define the potential resources, and to provide the materials technology and engineering concepts required to produce clean, high quality energy from subsurface magma bodies. It will be implemented in four general areas: (1) source location and definition, (2) source tapping, (3) magma/material compatibilities, and (4) energy extraction. Author (ERA)

N76-27690# Energy Research and Development Administration, Oak Ridge, Tenn.
ENERGY IN PERSPECTIVE
J. H. Hill and F. C. Huffman 1975 26 p refs Sponsored by ERDA
(TID-26900) Avail: NTIS HC $5.00

Increasing energy requirements are based on increasing populations and in the U.S., with a fourfold population increase since 1900, total energy consumption has increased fourteen fold. World data for energy per capita consumption, 1968, vs gross national product per capita are graphically compared. Energy sources and their end uses in the U.S. are summarized. Most energy sources for the future require technological development or demonstration to be considered for large blocks of power. The fast breeder reactor, solar energy, oil shales, liquefaction and gasification of coal, fusion reactors, hydrogen, geothermal energy, oil from tar sands, combustion and gasification of waste, superconducting solenoids, flywheels, the wind, the ocean tides, and thermal gradients in the oceans or large lakes are potential energy sources cited. The environmental impact from the winning and use of energy sources is described and may be mitigated through conservation. ERA

N76-27691# Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
ELECTROLYTIC GENERATION OF HYDRATED ELECTRON
A. S. G. Mazumdar and S. N. Guha 28 Jun. 1976 22 p refs
(BARC-787) Avail: ERDA Depository Libraries HC $3.50

Investigations on the electrolytic generation of hydrated electron in oxygenated as well as oxygen-free solutions at different pH were undertaken. Since the hydrated electron is known to react rapidly with O2 yielding the transient O2 ion, the latter was looked for through its interaction with phosphite ions resulting in their oxidation near the cathode. It appears from the results that in electrolytic processes, the primary electron (cathode) probably reacts directly with reactive solutes like oxygen, bypassing the hydration step. Data obtained in oxygen-free solutions, however, support the possible formation of hydrated electron at least in alkaline solutions. Author (NSA)

N76-27692# Oak Ridge National Lab., Tenn.
A 120 kA PULSED dc POWER SYSTEM WITH COMPUTERIZED THYRISTOR TRIGGERING
S. W. Mosko, D. D. Bates, R. R. Bigelow, E. K. Cottongim, E. W. Pipes, and K. Sueker 1975 17 p refs Presented at the Sixth Sym. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(CONF-751125-67) Avail: NTIS HC $4.50

A pulsed dc power system which provides 120 kA excitation current for the ORMAK toroidal field coils is described. A drive potential of 1000 volts brings the coils up to full current in ab out 0.5 seconds. Constant current is maintained for 0.25 seconds, then approximately 20 mil. joules of stored energy is dumped in a free-wheeling diode and resistance network. The power system contains 8 each, 30 kA, 500 V thyristor controlled dc power modules in a series/parallel combination. A control computer generates thyristor trigger pulses in a programmed sequence as required for the desired duty cycle. A feedback network including current sensing and computer software permits trigger timing adjustments as necessary for constant current operation. Author (NSA)

N76-27693# Brookhaven National Lab., Upton, N.Y.
ANALYSIS OF STEADY-STATE AND PULSED OPERATING REGIMES FOR CONTROLLED THERMO-NUCLEAR REACTORS WITH VERY LARGE POWER RATINGS
J. L. Usher and J. R. Powell Mar. 1975 121 p refs Sponsored by ERDA
(BNL-19947) Avail: NTIS HC $6.50

The operating regimes of large CTR's are identified and examined for cases of steady-state and pulsed operation. Several technological benefits of these large reactors are determined: (1) low maximum magnetic field strength requirements (25 to 50 percent less than for 5000 MW(th) reactors), (2) high n tau products (10 to the 15th power to 10 to the 17th power sec/cucm) with associated high burn-up fractions (10 to 50 percent), (3) relatively little problem with impurity build-up, and (4) long confinement times (50 to 500 seconds). The advantages of pulsed operation are also discussed: (1) smaller problem with impurities than in the steady-state case, (2) alleviation of any possible fueling difficulties, and (3) no problem with control of temperature in the pulsed reactor based on a simple control function model incorporating a finite delay time. Author (ERA)

N76-27694# Argonne National Lab., Ill.
SITE: A METHODOLOGY FOR ASSESSMENT OF ENERGY FACILITY SITING PATTERNS. REGIONAL STUDIES PROGRAM
N. A. Frigerio, L. J. Habegger, R. F. King, L. J. Hoover, N. A. Clark, and J. M. Cobian Aug. 1975 116 p refs
(Contract W-31-109-eng-38)
(ANL/AA-2) Avail: NTIS HC $5.45

A documentation is presented of the computerized SITE methodology that was developed for evaluating health, environmental, and socioeconomic impacts related to utilization of alternate sites for energy production within a region of interest. The cost, impact, and attribute vectors, which are generated and displayed on density maps, can be used in a multiparameter overlay process to identify preferable siting areas. The assessment of clustered facilities in energy centers is also possible within the SITE analysis framework. An application of the SITE methodology to Northern Illinois is presented. Also included is a description of the on-going extension of SITE for the accumulative evaluation of alternative regional siting patterns and fuel cycle options. An appendix provides documentation and user information for the SITE computer program. Author (NSA)

N76-27695# Centre National d'Etudes Spatiales, Toulouse (France).
ENERGY STORAGE: FEASIBILITY STUDY TO COLLECT, STORE AND RELEASE ENERGY FROM SOLAR ORIGIN, USING A KINETIC BATTERY [STOCKAGE D'ENERGIE - ETUDE DE FAISABILITE D'UNE EXPERIENCE DE CAPTATION, DE STOCKAGE PAR ACCUMULATEUR CINETIQUE ET DE RESTITUTION D'ENERGIE ELECTRIQUE D'ORIGINE SOLAIRE]
Bernard Tatry Feb. 1976 21 p refs In FRENCH; ENGLISH summary
(CNES-NT-31) Avail: NTIS HC $3.50

The feasibility of using solar energy to feed an autonomous station providing electric current continuously was studied. As an energy storage device a 'superflywheel' (rotor with composite fibers - magnetic bearings) would be used. Results show that such an experiment can be reasonably envisaged only in highly sunny countries and that it becomes non profitable at our latitudes, despite the very good performance of the flywheel storage device. ESA

N76-27696# Paul Sabatier Univ., Toulouse (France). Centre d'Etude Spatiale de Rayonnements.
THE EFFECT OF PARTICLE PHOTON RADIATION ON SOLAR CELLS Final Report
D. Bielle-Daspet, G. Gasset, and L. Castaner-Munoz Paris ESA Mar. 1976 133 p refs In FRENCH; ENGLISH summary
(Contract ESTEC-1786/72)
(ESA-CR-479) Avail: NTIS HC $6.00

The degradation of n+/p solar cells manufactured from 10 ohm cm aluminum or boron doped silicon produced by the Czrochalski or floating zone process was studied. Results show that the influence of the dopant and silicon lingot fabrication process on the base region minority carrier lifetime increases in the case of electrons of rather low energy (1 MeV). It is also shown that prolonged photon irradiation, following exposure to particulate radiation, tends to affect the degradation of a solar cell. Photon irradiation acts simultaneously in two ways: it lowers the defect density by eliminating certain defects and it increases the density by creating new defects. ESA

N76-27697# European Space Research and Technology Center, Noordwijk (Netherlands).
HERMETIC COVERS FOR EUROPEAN Ni/Cd CELLS
P. Montalenti Paris ESA Jan. 1976 35 p refs
(ESA-TN-131-ESTEC) Avail: NTIS HC $4.00

Various designs and technologies used in covers of European Ni/Cd battery cells are reviewed. Failure modes and test procedures for the assessment of failure modes are evaluated as the first part of a qualification program for the covers of Ni/Cd cells to be used in future European satellites. Electrochemical corrosion as failure mode, potentio-dynamic scanning as test criterion, and nickel plating as protection technique are highlighted. Author (ESA)

N76-27698# European Space Research and Technology Center, Noordwijk (Netherlands).
STATE VARIABLE STABILITY ANALYSIS OF MULTI-LOOP PWM CONTROLLED DC/DC REGULATORS IN LIGHT AND HEAVY MODE
A. Capel, J. G. Ferrante, and R. Prajoux (CNRS, Toulouse) 1975 13 p refs Presented at the Power Electron. Specialists Conf., Los Angeles, 9-11 Jun. 1975
Avail: NTIS HC $3.50

Stability analysis and transient response predictions of PWM controlled dc/dc regulators are discussed. A linear equivalent continuous model of the power stage was established for the boost and the buck converter by means of state variable representation for each of the elementary structure occurring within one sampling period. The equivalent model turned out to be of first order for the discontinuous mode and of second order for the continuous mode. A general computer program was implemented for the derivation of such a model and for the stability analysis and transient response of multiloop regulators. Special emphasis was given to the boost converter in light conduction mode operation whether an ac feedback loop was included or not. The existence of the non-minimum phase effect associated with such a regulator for a heavy operation mode was shown to be dependent of the sampling frequency.
Author (ESA)

N76-27699# Metropolitan Transportation Authority, Inc., New York.
ENERGY STORAGE PROPULSION SYSTEM FOR RAPID TRANSIT CARS. SYSTEM DESIGN AND EQUIPMENT DESCRIPTION
Donald Raskin and Ronald T. Yutko Sep. 1975 52 p Sponsored in part by N. Y. State Dept. of Transportation and AiResearch Mfg. Co., Torrance, Calif.
(Grant DOT-UT-550)
(PB-249063/9; UMTA-NY-06-0006-75-1) Avail: NTIS HC $4.50 CSCL 10C

When a transit rail car accelerates, it draws energy from a wayside electric power source; when it decelerates, the car must ride itself of this energy. Conventional rail cars dissipate this energy in the form of heat. A transit car propulsion system is described which will save much of this presently wasted energy by storing the car's kinetic energy in flywheels which are mounted below the car floor. The stored energy is then available for the subsequent acceleration of the car. Thus a significant reduction in energy usage is expected, along with a resultant reduction in subway tunnel heating. This energy storage propulsion system has been installed on two New York City subway cars and will be subjected to an extensive series of tests. GRA

N76-27700# Hittman Associates, Inc., Columbia, Md.
A STUDY OF THE PHYSICAL CHARACTERISTICS, ENERGY CONSUMPTION, AND RELATED INSTITUTIONAL FACTORS IN THE COMMERCIAL SECTOR Final Report
Harvey M. Berstein and Patrick M. McCarthy Dec. 1975 199 p refs
(Contract FEA-C-04-51888-00)
(PB-249470/6; HIT-630; FEA/D-76/053) Avail: NTIS HC $7.50 CSCL 13A

Specific areas addressed in the report are: physical characteristics of existing commercial buildings in Baltimore, Maryland and Denver, Colorado; energy consumption of existing buildings in Baltimore; institutional factors related to constructing and/or operating more energy efficient commercial buildings; policy options and their feasibility for inducing energy conservation through retrofit. GRA

N76-27701# Gordian Associates, Inc., New York.
OPPORTUNITIES AND INCENTIVES FOR ELECTRIC UTILITY LOAD MANAGEMENT Final Report
Apr. 1975 324 p refs
(Contract DI-14-01-0001-1842)
(PB-249348/4; FEA/D-75/528; FEA/D-CP-32) Avail: NTIS HC $9.75 CSCL 10B

The option of improved load management is seen as one solution to the crisis facing the utility industry and its consumers today. Load management has as its objective the achievement of a more optimum pattern of demand on distribution, transmission, and generation equipment so as to result in a more optimum utilization of all the scarce resources which are consumed in meeting demand. The study concludes that: (1) improved load management can effectively contribute to the conservation of scarce primary energy resources through satisfaction of the overall load with a more efficient mix of generating units; (2) improved load management can minimize the escalation of rates and alleviate the financial difficulties of investor-owned utilities by reducing requirements for capital equipment and by ensuring that incremental revenues match incremental costs. GRA

N76-27702# Gordian Associates, Inc., New York.
UCAN MANUAL OF CONSERVATION MEASURES Final Report
Nov. 1975 194 p refs
(Contract FEA-C-04-50235-00)
(PB-249343/5; FEA/D-CP-628; FEA/D-CP-35) Avail: NTIS HC $7.50 CSCL 10A

Efforts undertaken by individual utilities and regulatory agencies demonstrate the feasibility and effectiveness of a wide range of conservation measures. The underlying principles and estimated energy conservation potential of conservation measures are presented. Specific implementation strategies are discussed, while the practical experience gained by utility companies by carrying out these conservation measures is documented. GRA

N76-27703# Federal Energy Administration, Washington, D.C. Office of Energy Conservation and Environment.
GUIDE TO ENERGY CONSERVATION FOR FOOD SERVICE
Oct. 1975 83 p
(PB-249462/3; FEA/D-75/411) Avail: NTIS HC $5.00 CSCL 06H

Energy-saving suggestions for all types of food service operations are provided. Energy conservation steps are identified for food preparation and storage, lighting, heating, ventilating, and air conditioning, and sanitation. The potential for savings are listed, with emphasis placed on increasing the efficiency of presently used equipment. Detailed steps to enable a food service manager to chart his fuel usage and monthly energy consumption, and to analyze the results of his conservation efforts are given. GRA

N76-27704# Federal Energy Administration, Washington, D.C. Office of Energy Conservation and Environment.
ENERGY CONSERVATION POTENTIAL OF URBAN MASS TRANSIT
Mayo S. Stuntz, Jr. and Eric Hirst Dec. 1975 33 p refs
(PB-249336/9; FEA/D-75/621; Conservation-Paper-34) Avail: NTIS HC $4.00 CSCL 10A

Urban travel and its energy use are examined. The relative energy intensiveness of different automobile and transit services, recent experiments with improved transit service, and possible future energy impacts of expanded and improved transit are discussed. GRA

N76-27705# California Univ., Davis. Water Resources Center.
ENERGY REQUIREMENTS OF ALTERNATIVES IN WATER SUPPLY, USE, AND CONSERVATION: A PRELIMINARY REPORT
Edwin B. Roberts and Robert M. Hagan Dec. 1975 153 p refs
(PB-249995/2; Contrib-155; WRC-W480; W76-04800; OWRT-A-000-CAL(12)) Avail: NTIS HC $6.75 CSCL 13B

The energy required to supply water and the energy consumption associated with different uses of water and methods for water conservation and reuse were studied. Municipal water supplies considered include surface storage and diversion projects, ground water pumping, desalting, and wastewater reuse. Irrigation water supplies evaluated included groundwater pumping, the delivery of water to major service areas and reuse of municipal waste water. Waste-water treatment methods studies include primary, secondary, and tertiary treatment, and also land treatment. Methods used to estimate the amount of energy consumed indirectly for construction and maintenance of facilities are discussed. Estimates of indirect energy requirements are useful for comparing irrigation pumping plants powered by electricity and various fuels and for comparing the energy costs of damage to household items by poor quality water with the energy requirements for supply water of improved quality. GRA

N76-27706# B & K Engineering, Inc., Towson, Md.
EXAMINATION OF EARTH HEAT PIPES AT FAIRBANK HIGHWAY RESEARCH STATION Final Report, Jan. - Jul. 1975
Henry J. Suelau Jul. 1975 21 p refs
(PB-249735/2; BK006-1001) Avail: NTIS HC $3.50 CSCL 13B

This report decribes test and evaluation efforts conducted to determine the performance and degradation of selected heat pipes installed in the pavement deicing system at Fairbank Highway Research Station (FHRS). The primary objectives of this study were: (1) determine the amount of heat that an individual heat pipe can extract from the earth and (2) establish the cause of degraded performance exhibited by many of the heat pipes at FHRS. A calorimetric system capable of extracting and measuring thermal energy was designed and used to test individual heat pipes. The heat pipes' behavior during test and the test results demonstrate conclusively that the degraded performance was due to gas blockage of the condenser section. GRA

N76-27707# Honeywell, Inc., Horsham, Pa. Power Sources Center.
LITHIUM-ORGANIC ELECTROLYTE BATTERIES FOR SENSOR AND COMMUNICATIONS EQUIPMENT Final Report, 14 Jun. 1971 - 15 Mar. 1975
Aug. 1975 172 p refs
(Contract DAAB07-71-C-0191; DA Proj. 1G7-63702-DG-10) (AD-A020143; ECOM-71-0191-F) Avail: NTIS CSCL 10/3

Lithium-organic electrolyte cells and batteries were developed and fabricated for use in powering sensor and communications equipment. During the initial phase of the contract, the effort resulted in the development of a lithium disc cell design, employing vanadium pentoxide as the cathode material. Cell corrosion problems causing random failures and preventing battery delivery to ECOM are discussed. A battery safety study was also conducted. The second contract phase centered on the fabrication of lithium-sulfur dioxide batteries in the 15 volt BA-5386( )/U configuration for radio set AN/PRC-25 and -77 and other electronics applications. Incorporation of a safety venting system (Tefzel rupture disc) in the cell design and the conducting of a safety program comprised a significant portion of contract effort. Cell leakage through the non-hermetic seal and corrosion problems which precluded delivery of batteries are discussed. Battery test results and post mortem analyses are included. GRA

N76-27708# TRW Systems Group, Redondo Beach, Calif.
INVESTIGATION OF HIGH TEMPERATURE BATTERY SYSTEMS Final Report, 1 Jul. 1974 - 31 Aug. 1975
R. R. Sayano, M. L. McClanahan, J. A. Male, and N. Fried Dec. 1975 63 p refs
(Contract DAAB07-74-C-0587; DA Proj. 1S7-62705-AH-94P) (AD-A020164; TRW-26619-6013-RU-00; ECOM-74-0587-F) Avail: NTIS CSCL 10/3

Hermetically sealed sodium-sulfur cells intended to operate at 300 C in atmospheric environment and to deliver 10 A for 2 hr above 1.0 V for 100 cycles with a specific power and specific energy of 110 W/kg and 110 W hr/kg, respectively, were designed and fabricated. The cells were to withstand five thermal cycles from operating temperature to room temperature without loss of electrical performance. These cells utilized a disk shaped magnesium oxide-enriched beta-alumina electrolyte with low cost materials for cell containers. The seals used in the cell were all based on state-of-the-art technology and comprised a glass sealant between the beta-alumina electrolyte and the alpha-alumina rings, copper braze between the alpha-alumina rings and the Kovar cell containers, and laser welds between the Kovar cell containers and the stainless steel cell cover. Chromium plasma coating was used to protect the copper braze and Kovar against corrosion by sulfur and/or sodium polysulfide. No catastrophic cell failure due to cell design or materials of construction has been observed during testing of a cell for over 800 hr. GRA

N76-27709# Yardney Electric Corp., Pawcatuck, Conn.
STANDARD LINE RECHARGEABLE BATTERY SILVER-ZINC BB519/U Final Report, Jul. 1973 - Jan. 1975
J. Skelton Jan. 1975 42 p refs
(Contract DAAB07-73-C-0302; DA Proj. 1G7-63702-DG-10) (AD-A020365; ECOM-73-0302-F) Avail: NTIS CSCL 10/3

The electrochemical system used in this battery consists of silver and zinc electrodes. The electrolyte is a concentrated aqueous solution of potassium hydroxide. The separator system is proprietary to Yardney and is designed to assure excellent capacity maintenance after extended cycle life. The silver electrode is made from fine silver powder rolled onto a silver expanded metal grid. The zinc electrode is made from zinc oxide powder rolled onto a perforated copper grid. The separator system is wrapped around the positive electrode. The manufacturing processes used on these plates yield electrodes that offer strength and plate integrity sufficient to meet the environmental and mission requirements. The BB519 and BB462 Batteries have successfully demonstrated that a 16 pound Silver-zinc battery yielding 25 Ah can be integrated into the standard line configuration. The addition of a high rate battery to the standard line offers extended capability to man pack applications. GRA

N76-27710# Union Carbide Corp., Cleveland, Ohio. Battery Products Div.
EXTRUDED MAGNESIUM TUBING VERSUS IMPACT EXTRUDED CANS IN BA-4386/PRC-25 MAGNESIUM BATTERY Final Report, Jul. 1971 - Dec. 1974
L. F. Urry Dec. 1975 64 p
(Contract DAAB07-71-C-0235)
(AD-A020420; ECOM-71-0235-F) Avail: NTIS CSCL 10/3

Magnesium cells using cans made by plugging extruded magnesium tubing were compared with those made by the conventional impact extrusion from magnesium rod, in BA-4386/PRC-25 batteries, to determine if there was an effect on service, storageability and starting delays. Cells and batteries of both types were made simultaneously on standard production equipment, and since the AZ31 magnesium alloy specified was different from the AZ21 now standard for BA-4386/PRC-25 batteries, the rod for the control cans was extruded from the same alloy batch used for the tubing. Thus processability of the tubing was demonstrated and variables were minimized.

Whether the can is made from tubing or by impact extrusion, seems to have little effect on performance, and since tubing would be more costly, impact extrusion seems preferable. The composition of the magnesium alloy, and not how it is made into cans, seems to be the more significant variable in the performance of BA-486/PRC-25 magnesium batteries. GRA

N76-27711# EIC, Inc., Newton, Mass.
LITHIUM-INORGANIC ELECTROLYTE BATTERIES Quarterly Report, 16 Jun. - 15 Sep. 1975
Joseph R. Driscoll, Gerhard L. Holleck, David E. Toland, and S. Barry Brummer Jan. 1976 32 p refs
(Contract DAAB07-74-C-0030; DA Proj. 1T1-61102-A-34A)
(AD-A020450; C-401-8; ECOM-74-0030-8; QR-8) Avail: NTIS CSCL 10/3

A $SOCl_2$-based, Li primary battery operable over the temperature range -40 to +160F is being evaluated. The desired energy density is 150 watt-hours per pound of total battery weight and the desired energy density is 50 watts per pound. The major area of investigation during this report period has been in connection with the voltage delays observed after storage at 71C. These are due to formation of films on the Li electrode from its reaction with the solution. The effects on these films of storage time, electrolyte purity and alloying of the Li have been explored. The effect of various electrode pretreatments such as chemical and electrochemical etching of the Li surface on the high temperature storage behavior was investigated. GRA

N76-27712# Naval Undersea Center, San Diego, Calif.
DEVELOPMENT OF LITHIUM INORGANIC ELECTROLYTE BATTERIES FOR NAVY APPLICATIONS
J. F. McCartney, W. H. Shipman, and C. R. Gundersen Oct. 1975 108 p refs
(AD-A020844; NUC-TN-1618) Avail: NTIS CSCL 10/3

During Fiscal Year 1975 the Naval Undersea Center (NUC) performed an extensive test program with low-rate and high-rate lithium-thionyl chloride cells. This program has aided in identifying capabilities and deficiencies with the present technology. Many deficiencies were readily corrected but others are less understood and additional development is required. As a result of this program, improved, low-discharge rate, hermetically sealed cells and batteries are being used in several ocean oriented applications. Future development programs are planned to provide safe, high-discharge rate cells for propulsion and pulse-power applications. Author (GRA)

N76-27713# Naval Postgraduate School, Monterey, Calif.
A COMPUTER ANALYSIS FOR THE DETERMINATION OF ELECTRODE VOLTAGE LOSES IN MAGNETOHYDRODYNAMIC-GENERATOR PLASMAS Ph.D. Thesis
Richard Charles Dolson Dec. 1975 150 p refs
(AD-A020081) Avail: NTIS CSCL 10/2

This work investigates the nature and extent of the voltage drops in the vicinity of MHD non-emitting electrodes, especially the losses attributable to the sheath. The non-existence of a one-dimensional sheath solution is proved, and a computer model with two-dimensional, periodic active sites representing a flat plate electrode is developed. The sheath and ambipolar regions evolve from the same set of equations in a self-consistent way, obviating the requirement to match boundary conditions between the regions. With this model the effects of a magnetic field and Joule heating are studied. Results are compared with experimental observations. To supplement the sheath investigation a peripheral study of the boundary layer voltage losses has been made and a relatively simple technique for determining these losses is presented. GRA

N76-27714# Lockheed Missiles and Space Co., Palo Alto, Calif.
ANALYSIS OF POROUS ELECTRODES WITH SPARINGLY SOLUBLE REACTANTS, 4 APPLICATION TO PARTICULATE BED ELECTRODE: Ag/AgCl SYSTEM
Theodore Katan, Hiram Gu (Calif. Univ., Los Angeles), and Douglas N. Bennion (Calif. Univ., Los Angeles) 15 Jan. 1976 33 p refs
(Contract N00014-73-C-0397)
(AD-A019580; LMSC-D464335; TR-4) Avail: NTIS CSCL 10/3

Experiments were conducted to characterize critical processes affecting performance of totally-immersed, porous, secondary electrodes. Reaction product (AgCl) distribution and polarization-time behavior under galvanostatic conditions determined experimentally are in good accord with a recently developed mathematical model. GRA

N76-27715# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ALLOCATION OF GENERATOR RESOURCES FOR MAXIMUM OPERATING EFFICIENCY M.S. Thesis
Russell L. Keeling Dec. 1975 81 p refs
(AD-A019858; GE/EE/75-35) Avail: NTIS CSCL 10/2

A determination of the most economical manner of managing thermal generators in a single power facility is made. System load is modeled as a point load at the plant bus. Applying this load restriction, the operating condition necessary for optimum plant efficiency is derived using the Lagrange method of solving equations containing variables and constraints. Input-output curves of the thermal generators are approximated by linear segments. An algorithm to ascertain the optimum solution while using typical generator data is developed and implemented into a FORTRAN computer program. This routine specifies not only the incrementing procedure to be used under fluctuating loads, but also the exact power output required of each committed generator to enable the plant to meet a specified load most economically. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N76-27716# Committee on Science and Technology (U. S. House).
ENVIRONMENTAL R AND D POSTURE HEARINGS
Washington GPO 1975 990 p refs Hearing before Subcomm. on the Environment and the Atmosphere of Comm. on Sci. and Technol., 94th Congr., 1st Sess., No. 21, 22-24, 29-30 Apr. and 1 May 1975
(GPO-57-591) Avail: Subcomm. on the Environment and the Atmosphere

Testimony regarding governmental activities in numerous areas of environmental research and development is presented. Topics covered include air and water pollution, environment protection, agriculture, meteorology, oceanography and earth resources management. D.M.L.

N76-27717*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
ENVIRONMENTAL PARAMETERS OF THE TENNESSEE RIVER IN ALABAMA. 2: PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS Final Report
Lorraine M. Rosing Jun. 1976 285 p refs
(Contract NAS8-30772)
(NASA-CR-149926; UAH-RR-173) Avail: NTIS HC $9.25 CSCL 13B

Physical, chemical and biological water quality data from five sites in the Tennessee River, two in Guntersville Reservoir and three in Wheeler Reservoir were correlated with climatological data for three annual cycles. Two of the annual cycles are for the years prior to the Browns Ferry Nuclear Power Plant operations and one is for the first 14 months of Plant operations. A comparison of the results of the annual cycles indicates that two distinct physical conditions in the reservoirs occur, one during the warm months when the reservoirs are at capacity and one during the colder winter months when the reservoirs have been drawn-down for water storage during the rainy months and for weed control. The wide variations of physical and chemical parameters to which the biological organisms are subjected on an annual basis control the biological organisms and their population levels. A comparison of the parameters of the site below the Power plant indicates that the heated effluent from the plant operating with two of the three reactors has not had any effect on the organisms at this site. Recommendations given include the development of prediction mathematical models (statistical analysis) for the physical and chemical parameters

under specific climatological conditions which affect biological organisms. Tabulated data of chemical analysis of water and organism populations studied is given. Author

N76-27718*# Old Dominion Univ. Research Foundation, Norfolk, Va.
AEROSAL STUDIES Final Report, 1 Nov. 1972 - 30 Oct. 1975
Franklin S. Harris, Jr. Jun. 1976 7 p
(Grant NGR-47-003-068)
(NASA-CR-148294; PGS-TR-AP-76-37) Avail: NTIS HC $3.50 CSCL 13B

Various methods of measuring aerosols were studied in terms of the best methods to use, the instruments or techniques actually employed, and those techniques applied in field measurements on air quality as influenced by rocket launch effluents, and in an urban environment. Further studies were initiated on the remote sensing of aerosols by satellites and the influence of aerosols on visibility. The characterization of aerosols by measurement of scattered light was studied on Mie theory calculations. Author

N76-27719# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
METHANE REACTION RATE DETERMINATION WITH CORRECTION FOR FINITE QUENCHING RATES
Jerry Lee Hall and John Herrin 21 May 1976 36 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in November 1976
(ERI-76326) Avail: NTIS HC $4.00

The feasibility of using a simple shock tube, without modifications to enhance the quenching rate, was explored. A simple shock tube was used to study the pyrolysis of methane. The shock tube was operated in the tailored interface mode, and the reaction temperature ranged from 1,650 to 2,100 K, with the total reaction pressure up to 6.4 x 100,000 Pascal. The chemical reaction occurred behind the reflected shock wave, near the end wall of the test section. A sampling system was developed to allow a sample of product gas to be withdrawn from the test section before it was contaminated by the driver gas. The rate constant for methane pyrolysis obtained in this study approaches the value reported in an optical study for temperatures above 1750 K. However, the results are subject to considerable scatter. Possible explanations for this scatter are given. Finally, a method is developed to correct the rate constant determinations for any finite-quenching-rate error. This correction, applied to data of this study, resulted in a decrease in the rate constant, bringing it closer to the result of the optical study. Author

N76-27720*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INVESTIGATION OF SIZE-DEPENDENT CONCENTRATION OF TRACE ELEMENTS IN AEROSOLS EMITTED FROM THE OIL-FIRED HEATING PLANTS
Jag J. Singh, R. J. Sentell, and G. S. Khandelwal (Old Dominion Univ.) Washington Jul. 1976 29 p refs
(NASA-TM-X-3401; L-10875) Avail: NTIS HC $4.00 CSCL 13B

Aerosols emitted from two oil-fired heating plants were aerodynamically separated into eight size groups and were analyzed using the photon-induced X-ray emission (PIXE) technique. It was found that Zn, Mo, Ag, and Pb, and (to a lesser extent) Cd, have a tendency to concentrate preferentially on the smaller aerosols. All of these elements, in certain chemical forms, are known to be toxic. Zinc and molybdenum, although present in low concentrations in the parent fuels, show the [illegible] tendencies to be concentrated in finer aerosols. [illegible] reported to show a very strong tendency to concentration in finer fly ash from coal-fired power plants shows little preference for surface residence. Vanadium, which occurs in significant concentration in the oil fuels for both plants, also shows little preference for surface concentration. Even though the absolute concentrations of the toxic elements involved are well below the safety levels established by the National Institute for Occupational Safety and Health (NIOSH), it would be advisable to raise the heights of the heating-plant exhaust chimneys well above the neighborhood buildings to insure more efficient aerosol dispersal. Author

N76-27721*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
WATER HYACINTHS AND ALLIGATOR WEEDS FOR FINAL FILTRATION OF SEWAGE
B. C. Wolverton, R. C. McDonald, and J. Gordon 21 May 1976 10 p refs
(NASA-TM-X-72724) Avail: NTIS HC $3.50 CSCL 13B

The potential of water hyacinths (Eichhornia crassipes) (Mart.) Solms and alligator weeds (Alternanthera philoxerides) (Mart.) Griesb. as secondary and tertiary filtration systems for domestic sewage was demonstrated. These two vascular aquatic plants reduced the suspended solids, total Kjeldahl nitrogen, total phosphorus, BOD sub 5, and total organic carbon levels in domestic sewage from 60 percent to 98 percent within a two week period. These plants grown in domestic sewage were also free of toxic levels of trace heavy metals. Author

N76-27722# Argonne National Lab., Ill.
PROCEEDINGS OF WORKSHOP ON THE SOCIAL CONSEQUENCES OF WASTE HEAT DISCHARGE ALTERNATIVES
B. P. Butz, B. A. G. Lewis, H. P. Friesema, and A. N. Halter Aug. 1975 43 p refs Conf. held at Argonne, Ill., 9 Jun. 1975 Sponsored by ERDA
(CONF-750692) Avail: NTIS HC $5.25

The workshop was attended by individuals representing federal regulatory and research agencies, universities, private industry, and citizen interest groups. The staff presented papers on quantification of social consequences, environmental considerations, social considerations, and economic considerations. Participant recommendations were made with regard to the impact matrix technique, technology assessment, and the program philosophy. The principal recommendations were that site specific cases be analyzed, careful extrapolation of results be made region by region, generic impact matrices be handled very carefully or avoided, and methodology development be initiated. ERA

N76-27723# California Univ., Livermore. Lawrence Livermore Lab.
PORTABLE MICROWAVE SPECTROMETER ANALYZER FOR CHEMICAL CONTAMINANTS IN AIR: A FEASIBILITY STUDY Final Report
R. L. Morrison and A. Maddux 28 Oct. 1975 24 p refs
(Contract W-7405-eng-48)
(UCRL-51945) Avail: NTIS HC $4.00

A feasibility study for the construction of a field-portable microwave spectrometer analyzer for chemical contaminants in air was conducted. A set of design specifications that will result in an instrument capable of analyzing 10 separate gases at the required NIOSH detection limits were developed. The system will use either a YIG-tuned Gunn-effect oscillator or multiple-varactor-tuned Gunn-effect oscillator, and the required stability will be achieved by a new gas absorption line frequency-locking technique. Author (ERA)

N76-27724# Energy Research and Development Administration, Pittsburgh, Pa. Energy Research Center.
MASS SPECTROMETRIC ANALYSIS OF STREAMS FROM COAL GASIFICATION AND LIQUEFACTION PROCESSES
A. G. Sharkey, Jr., J. L. Shultz, C. E. Schmidt, and R. A. Friedel Nov. 1975 28 p refs
(PERC/RI-75/5) Avail: NTIS HC $4.00

Streams from coal gasification and coal hydrogenation processes are outlined and examples given for the analysis of coal, gas, oil, tar, and process water. Deficiencies in current mass spectrometric methods as applied to coal-derived fuels are reviewed, and needs for future analytical research are discussed. Author (ERA)

N76-27725# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER-CONTROLLED SAMPLING SYSTEM FOR AIRBORNE PARTICULATES
C. F. Hall, L. R. Anspaugh, J. S. Koval, P. L. Phelps, and R. J. Steinhaus 14 Aug. 1975 25 p refs
(Contract W-7405-eng-48)
(UCRL-51886) Avail: NTIS HC $3.50

A self contained, mobile, computer controlled air sampling system has been designed and fabricated that also collects and

records the data from eight meteorological sensors. The air samplers are activated automatically when the collected meteorological data meet the criteria specified at the beginning of the data collection run. The filters from the samplers are intended to collect airborne Pu-239 for later radionuclide analysis and correlation with the meteorological data for the study of resuspended airborne radioactivity and for the development of a predictive model. This paper describes the system hardware, discusses the system and software concepts, and outlines the operational procedures for the system. Author (ERA)

N76-27726# Puerto Rico Nuclear Center, Mayaguez.
ENVIRONMENTAL MONITORING OF Ar-41
D. S. Sasscer and C. Andreu 1975 2 p Presented at the 9th Topical Symp. on Operational Health Phs., Denver
(CONF-760202-14) Avail: NTIS HC $4.50

The objective of this investigation was to develop a simple and accurate procedure for measuring argon-41 in unrestricted areas when this radioactive noble gas exists in concentrations significantly below the new recommended allowable concentration. These measurements were made in order to provide an accurate and simple verification of the results obtained when using prediction models for the spatial variation of the concentration of gases released from a source. The highly sensitive system which was developed to measure argon-41 at a concentration which is less than 2 percent of the previously allowable value consisted of: connecting a four inch by four inch and a three inch by a three inch sodium iodide detector in parallel; measuring concentrated samples of air in scuba tank filled to 2,200 psi by means of a high pressure pump; and obtaining low radioactive background by locating the detectors and scuba air samples tank in a lead cave with six inch thick walls. Author (NSA)

N76-27727# AEG-Telefunken, Frankfurt am Main (West Germany).
LASER SOURCES FOR GAS ANALYSIS EQUIPMENT IN 2 - 20 MICRON RANGE. PART 2: PARAMETRIC OSCILLATOR FOR 2 - 10 MICRON Final Report [LASERSTRAHLUNGSQUELLEN FUER GASANALYSENGERAETE IM SPEKTRALBEREICH VON 2 - 20 MICROMETER. TEIL 2: PARAMETRISCHER OSCILLATOR FUER 2 - 10 MICROMETER]
Harald Matthes, N. Marschall, and P. Korczak Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1975 77 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-47) Avail: NTIS HC $5.00; ZLDI, Munich DM 16.20

A tunable solid state laser in the form of a parametric oscillator can be used for the detection of air pollution gases. The ternary sulfide AgGaS2 is of special interest for the use as nonlinear-optical material. However, this material was not available in single crystalline form of the required quality. Therefore the growth process was investigated to obtain such high quality crystals. Sufficiently large (5 x 5 x 5 cu mm), crackfree and twinfree crystals could be obtained by the Bridgman method after optimizing the composition of the melt and the geometry of the quartz ampoules. A decisive improvement of the transmission properties could be obtained by a subsequent annealing process. Author (ESA)

N76-27728# Delft Hydraulics Lab. (Netherlands).
THE ADVECTION-DISPERSION EQUATION FOR AN ISOTROPIC MEDIUM SOLVED BY FRACTIONAL-STEP METHODS
G. K. Verboom Dec. 1975 16 p refs Presented at the Intern. Conf. on Math. Models for Environ. Problems, Southampton, Engl., 8-12 Sep. 1975
(Publ-157) Avail: NTIS HC $3.50

The solution of an advection-dispersion equation for an isotropic medium by the fractional step method was applied to aquatic environments such as rivers, lakes, estuaries and coastal seas. It is demonstrated that the fractional-step method is suitable for solving the one and multi-dimensional advection-dispersion equation. The method can be used to great advantage if some coefficients are of an order of magnitude larger than other coefficients, whereas the transport mechanism cannot be neglected. Due to an accuracy criterion the explicit schemes are to be preferred to the implicit Crank-Nickolson formula. ESA

N76-27729# Urban Inst., Washington, D.C.
COST-BENEFIT ANALYSIS AND WATER POLLUTION POLICY
Henry M. Peskin and Eugene P. Seskin 1975 375 p refs Sponsored in part by EPA
(PB-249900/2; URI-77000; ISBN-0-87766-120-0; LC-74-82074) Avail: NTIS HC $9.00 CSCL 13B

The editors and 17 other authors probe the state of the art of cost-benefit analysis as related to water pollution. They survey the existing literature on costs and benefits, discuss the difficulties of measuring both costs and benefits, and suggest measures for overcoming them, both from theoretical perspectives and in terms of actual applications to practical situations involving pollution. Such questions as how to assign monetary values to good health and the perpetuation of life are confronted. The authors discuss the implications for public policy from many angles - where the pollution should be measured, who should pay (and how much) for water pollution abatement, whether pollution reaches a 'point of no return' after which bodies of water can no longer be cleaned up, what control mechanisms are feasible, and whether institutional changes are needed to take account of the 'common property' feature of natural resources. The chapters are based on a 1973 symposium sponsored by the Environmental Protection Agency. GRA

N76-27730# Stanford Research Inst., Menlo Park, Calif.
SELECTING SITES FOR CARBON MONOXIDE MONITORING Final Report
F. L. Ludwig and J. H. S. Kealoha Sep. 1975 165 p refs
(Contract EPA-68-02-1471)
(PB-249700/6; EPA-450/3-75-077) Avail: NTIS HC $6.75 CSCL 13B

Procedures and criteria are presented for selecting appropriate locations for carbon monoxide (CO) monitoring stations. The purposes for which CO concentrations are measured are reviewed and classified according to a system based on special scales of representativeness. Procedures are given for selecting locations that will provide CO measurements representative of downtown street canyon areas, along major traffic corridors, urban neighborhoods, and larger interurban regions. Specific recommendations are included for inlet heights, distances from major and minor roadways and placement relative to urban areas. Appendices discuss sources of information useful to the site selection process, such as climatological data, land use information, and traffic data. GRA

N76-27731# PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio.
MONITORING VINYL CHLORIDE AROUND POLYVINYL CHLORIDE FABRICATION PLANTS Final Report
Oct. 1975 111 p refs
(Contract EPA-68-02-1375)
(PB-249695/8; EPA-450/3-75-084) Avail: NTIS HC $5.50 CSCL 13B

A program to measure vinyl chloride emissions from polyvinyl chloride fabrication plants was carried out. Four charcoal collectors were stationed around each of five PVC fabrication plants. 24-hour samples were collected daily for 14 days around each plant. Analysis of the collected samples was by gas chromatography. Most of the samples contained less than the minimum detectable amount of VCM. GRA

N76-27732# Pacific Environmental Services, Inc., Santa Monica, Calif.
EVALUATION OF NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) NON-ATTAINMENT: METHODOLOGY AND EXAMPLE TOTAL SUSPENDED PARTICULATE ANALYSIS FOR SPOKANE COUNTY Report for Jul. 1975 - Jan. 1976
Victor Yamada, Robert Missen, and Michael Schultz (EPA, Seattle) Jan. 1976 146 p refs
(Contract EPA-68-02-1378)
(PB-249793/1; EPA-910/9-75-016) Avail: NTIS HC $6.00 CSCL 13B

A methodology is presented to asses reasons for nonattain-

ment of NAAQS and to propose corrective actions which would lead to attainment of the standards. An application of this methodology to evaluate the TSP nonattainment situation in Spokane County is also presented. The methodology, tailored primarily for TSP and SO2, consist primarily of a logical, primarily nonmodeling approach to identifying source-receptor relationships and an analysis of the development, implementation, and enforcement of the existing SIP. Likely categories of corrective actions are also presented. GRA

N76-27733+ Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.

URBANIZATION AND SEDIMENTATION: A BIBLIOGRAPHY, VOLUME 2

Dec. 1975 156 p refs

(PB-249832/7; OWRT/WRSIC-75/207-Vol-2; W76-04506-Vol-2) Avail: NTIS HC $6.75 CSCL 13B

Another in a series of planned bibliographies in water resources produced from the information base comprising selected water resources abstracts is presented. The portion of the data base searched for this volume included 58,593 abstracts covering October 1971 through October 15, 1975 (Volume 8, Number 20). Author and subject indexes are included. GRA

N76-27734# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.

THE STRATOSPHERE PERTURBED BY PROPULSION EFFLUENTS: CIAP MONOGRAPH 3 Final Report

Sep. 1975 746 p refs

(Contract DOT-OS-30057)

(PB-249684/2; DOT-TST-75-53) Avail: NTIS HC $18.75 CSCL 04A

The Climatic Impact Assessment Program (CIAP) of the U.S. Department of Transportation is charged with the 'assessment' of the impact of future aircraft fleets and other vehicles operating in, or transiting through, the stratosphere. Monograph 3 considers the perturbations of the radiation fluxes, and therefore the composition of the stratosphere, that are produced by the emission of engine effluents from potential, large-scale operations of aircraft in the lower stratosphere (e.g., 29 to 69 kft or 9 to 21 km). The important engine emissions are the odd nitrogen oxides (NOx or NO and NO2), sulfur dioxide (SO2), and water vapor (H2O). Monograph 3 considers the significant perturbations in the composition of the radiative species in the stratosphere, which include ozone (O3), nitrogen dioxide (NO2), sulfuric acid aerosols (75 percent H2SO4), and water vapor. These considerations require an understanding of complex phenomena involving radiative, chemical, dynamic, and thermodynamic processes in the stratosphere. Since CIAP is concerned with predictions of effects that take place in the distant future, the methodology used for this purpose is based on models of atmospheric phenomena. GRA

N76-27735# GEOMET, Inc., Gaithersburg, Md.

EVALUATION OF THE MULTIPLE SOURCE GAUSSIAN PLUME DIFFUSION MODEL, PHASE 2 Final Report

Robert C. Koch and Scott D. Thayer Apr. 1975 61 p refs

(Contract EPA-68-02-0281)

(PB-249729/5; GEOMET-EF-467; EPA-650/4-75-018-b) Avail: NTIS HC $4.50 CSCL 13B

A computer model for estimating air pollution concentrations from multiple sources is compared with measured SO2 and particulate concentrations and with other model calculations. The model is capable of estimating short-term and long-term concentrations, and produces results which are equivalent in validity to results produced with other models. Since the model represents hourly variations in both emissions and meteorological condition, the report considers available sources of data and how these can best be used to estimate parameters for the model. Use of temperature and industrial and commercial activity indexes to estimate seasonal and diurnal variations in emissions is discussed. Use of slow-rise balloon soundings taken in urban areas is discussed as a possible supplement to conventional weather data. Finally, the applicability of using sampled calculations when estimating short-term maximum concentrations is evaluated. GRA

N76-27736# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

STANDARD SUPPORT AND ENVIRONMENTAL IMPACT STATEMENT: EMISSION STANDARD FOR VINYL CHLORIDE

Oct. 1975 536 p refs

(PB-249703/0; EPA-450/2-75-009) Avail: NTIS HC $13.00 CSCL 13B

A national emission standard for vinyl chloride emitted from ethylene dichloride-vinyl chloride and polyvinyl chloride plants is proposed. Vinyl chloride is implicated as the causal agent of angiosarcoma and other serious disorders, both carcinogenic and noncarcinogenic, in people with occupational exposure and in animals with experimental exposure to vinyl chloride. The purpose of the proposed standard is to minimize vinyl chloride emissions from all known process and fugitive emission sources in ethylene dichloride-vinyl chloride and polyvinyl chloride plants. This is estimated to have the effect of reducing emissions by approximately 94 percent. Environmental Impact and Inflation Impact Statements quantifying the impacts of the proposed standard and alternative control levels are included. GRA

N76-27737# Connecticut Univ., Storrs. Inst. of Water Resources.

CHEMICAL ANALYSIS AND PROCESS CLASSIFICATION OF EFFLUENTS (ORGANIC NITROGEN IN ACTIVATED CARBON EFFLUENTS) Completion Report

T. B. Helfgott Dec. 1975 24 p refs

(Contract DI-14-31-0001-5007)

(PB-249816/0; W76-04387; OWRT-A-030-CONN(9)) Avail: NTIS HC $3.50 CSCL 07C

Process response and chemical analysis were used to study the residual organic constituents in waters, especially the nitrogen-bearing components of wastewater treatment effluents. Special real-time (quick instrumentation measurement) techniques were developed to measure nitrogen in its transient forms (from organic nitrogen to ammonia to nitrate) as the nitrogen passes through unit operations and processes necessary in wastewater treatment to remove nitrogenous organics. There are residual and refractory organics in municipal wastewaters as measured by total organic carbon (approximately 3 mg/l TOC) that are dispersed, are non-adsorbable onto activated carbon, are cationic at high pH (approximately 9-16) and resist ozonation/degradation. The residual organics were identified as some basic amino acids - lysine, arginine and ornithine - in polypeptide form. These microcolloids can be removed from treatment water by processes that take advantage of the charge on these nitrogenous organics. The processes that can remove the polymeric forms of basic amino acids are ion exchange and electrodialysis. GRA

N76-27738# Clemson Univ., S.C. Water Resources Research Inst.

AN ECONOMIC EVALUATION OF WATER QUALITY MANAGEMENT SYSTEMS Completion Report

Hugh H. Macaulay and T. Bruce Yandle, Jr. Oct. 1975 84 p refs

(Contracts DI-14-31-0001-4041; DI-14-31-0001-5041)

(PB-249741/0; WRRI-58; W76-04514; OWRT-A-030-SC(2)) Avail: NTIS HC $5.00 CSCL 13B

There are three general economic policies for dealing with water pollution, each one with a different following. Politicians and government administration prefer regulations to restrict the amount of waste discharged by firms. Businessmen prefer government subsidies for cleaning up their effluent. Economists prefer charges on wastes discharged, based on the marginal damage done. All three are discussed. Regulations are described as inefficient, capricious, and destined to create dissatisfaction on the part of all parties affected. Subsidies are even more inefficient, administratively difficult, and have probably reduced the treatment of wastes. Charges may result in significant transaction costs but should be the most efficient in waste treatment and production of final output. But charges should be levied on all users of water quality, not on mills and municipalities only. Water pollution policies in Germany, England, the Netherlands, and France are examined and evaluated. GRA

N76-27739# California Univ., Davis. Water Resources Center.
SOIL WATER REPELLANCY AND THE USE OF NONIONIC SURFACTANTS
J. Letey, J. F. Osborn, and N. Valoras Dec. 1975 92 p refs (Contract DI-14-31-0001-3562)
(PB-249472/2; Contrib-154; W76-04001; OWRT-B-141-CAL(9)) Avail: NTIS HC $5.00 CSCL 08H

Research was conducted (1) to determine factors causing soil water repellency, (2) to characterize and measure soil water repellency magnitude, and (3) to determine the effect of soil water repellency on various soil-water flow processes. A number of factors are involved in the formation of soil water repellency, but presence of plant litter and a soil relatively high in sand content appear to be the most important factors. High temperatures, such as those associated with fire, intensify the degree of soil water repellency. Soil water repellency can be characterized by the liquid-solid contact angle, solid-air surface tension, water drop penetration time, 90 degree surface tension, and a water repellency index. Addition of nonionic surfactants to water allows for a higher infiltration rate in a water repellent soil. GRA

N76-27740# Argonne National Lab., Ill. Energy and Environmental Systems Div.
AIR QUALITY ANALYSIS WORKSHOP, VOLUME 1 Final Report
R. R. Cirillo, J. F. Tschanz, A. E. Smith, J. E. Camaioni, R. Freeman, and V. Rabl Nov. 1975 372 p refs
(PB-249792/3; EPA-450/3-75-080-A-Vol-1) Avail: NTIS HC $10.50 CSCL 13B

The air quality analysis system to be used for developing a control program for attaining and maintaining the National Ambient Air Quality Standards is given. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N76-27741 Iowa Univ., Iowa City.
VARIATIONS OF LOW-ENERGY ELECTRON INTENSITIES IN THE DISTANT POLAR MAGNETOSPHERE ASSOCIATED WITH INTERPLANETARY SECTOR STRUCTURES Ph.D. Thesis
David Merle Yeager 1975 72 p
Avail: Univ. Microfilms Order No. 76-13464

The eccentric-orbiting satellite IMP-5 often penetrated the distant polar magnetosphere at positions corresponding to those for magnetic field lines intersecting the earth's northern polar cap. The observational period covered here was January through October 1970. Electron intensities were lesser by orders of magnitude than those typically encountered within, for examples, the plasma sheet and over the auroral oval. Dramatic temporal variations in the electron intensities by factors of 50 on polar-cap field lines were found for orbit-to-orbit comparisons. Intensity variations showed a remarkable correlation with the magnetic sector structure in the interplanetary medium--high intensities for away from the sun sectors and low intensities for toward sectors. Dissert. Abstr.

N76-27742 Florida Univ., Gainesville.
SCATTERED SUNLIGHT IN THE ATMOSPHERE, FROM THE MIDDLE ULTRAVIOLET THROUGH THE NEAR INFRARED Ph.D. Thesis
Richard Douglas McPeters 1975 173 p
Avail: Univ. Microfilms Order No. 76-12093

Computer modeling and comparison with aerosol measurements were used to study atmospheric sunlight scattering. An analytical technique was developed to determine the aerosol optical depth from solar radiometer measurements in the ultraviolet. A photographic technique was used to measure the scattered light of the solar aureole for comparison with a curved earth modified single scattering calculation. Dissert. Abstr.

N76-27743 Miami Univ., Coral Gables, Fla.
A STUDY OF THE INFLUENCE OF THE OCEAN ON ATMOSPHERIC RADIATIVE HEATING AND SHORT WAVE PLANETARY ALBEDO Ph.D. Thesis
Michael Moises Jacobs 1975 97 p
Avail: Univ. Microfilms Order No. 76-12844

A study of the influence of the ocean on atmospheric radiative heating is presented. The model includes an atmosphere with air molecules, aerosol particles, ozone, and water vapor and the ocean below. Heating at low altitudes is a strong function of the treatment given water vapor, the concentration of which is highly variable. The heating rate depends strongly on solar incidence angle. Foam or whitecaps on the ocean surface causes an increase in the heating, mainly in the stratosphere and at low altitudes. It appears that the heating is not dependent on water type, for known waters. For hypothetical waters with very high reflectances, the heating is increased, but only for extremely improbable water types. The radiation lost to space and total reflectance of the ocean-atmosphere system is shown to depend strongly on solar angle, foam coverage, and water type.
Dissert. Abstr.

N76-27744 Pittsburgh Univ., Pa.
LATITUDINAL DEPENDENCE OF ATOMIC OXYGEN DENSITY BETWEEN 90 AND 120 KILOMETERS AS DERIVED FROM OGO-6 OBSERVATIONS OF THE 5577 A NIGHTGLOW Ph.D. Thesis
Barry Wasser 1975 99 p
Avail: Univ. Microfilms Order No. 76-14179

A photometer on board OGO-6 was used to study atomic oxygen densities between 80 and 120 km altitude during November, 1969. Densities were inferred from the 5577 A emission observed in nightglow. To take account of density variations below the altitude of maximum slant emission rate, data from several consecutive scans in a vertical plane were used to produce near synoptic maps of volume emission rates and atomic oxygen densities. The profiles showed peaks at about 97 km with densities that varied between 2.1 x 10 to the 11th power and 3.5 x 10 to the 11th power atoms/cu cm. The densities at 90 km varied between 2.0 x 10 to the 10th power and 1.7 x 10 to the 11th power atoms/cu cm. The deduced atomic oxygen density profiles between 90 km and 100 km were then compared with the solution to the continuity equation in the same range. The theoretical curves agreed to within 20-25% of the curves deduced from the nightglow observations. In addition, mechanisms for atomic oxygen loss and atmospheric heating were considered. Dissert. Abstr.

N76-27745*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CUBIC SPLINE FUNCTION INTERPOLATION IN ATMOSPHERE MODELS FOR THE SOFTWARE DEVELOPMENT LABORATORY: FORMULATION AND DATA
James C. Kirkpatrick May 1976 125 p refs
(NASA-TM-X-58183; JSC-08964) Avail: NTIS HC $5.50 CSCL 04A

A tabulation of selected altitude-correlated values of pressure, density, speed of sound, and coefficient of viscosity for each of six models of the atmosphere is presented in block data format. Interpolation for the desired atmospheric parameters is performed by using cubic spline functions. The recursive relations necessary to compute the cubic spline function coefficients are derived and implemented in subroutine form. Three companion subprograms, which form the preprocessor and processor, are also presented. These subprograms, together with the data element, compose the spline fit atmosphere package. Detailed FLOWGM flow charts and FORTRAN listings of the atmosphere package are presented in the appendix. Author

N76-27746*# Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering.
MODELS FOR INFRARED ATMOSPHERIC RADIATION
Surendra N. Tiwari Jun. 1976 140 p refs
(Grant NsG-1153)
(NASA-CR-148314; ODU-TR-76-T10) Avail: NTIS HC $6.00 CSCL 04A

Line and band models for infrared spectral absorption are discussed. Radiative transmittance and integrated absorptance

of Lorentz, Doppler, and voigt line profiles were compared for a range of parameters. It was found that, for the intermediate path lengths, the combined Lorentz-Doppler (Voigt) profile is essential in calculating the atmospheric transmittance. Narrow band model relations for absorptance were used to develop exact formulations for total absorption by four wide band models. Several continuous correlations for the absorption of a wide band model were compared with the numerical solutions of the wide band models. By employing the line-by-line and quasi-random band model formulations, computational procedures were developed for evaluating transmittance and upwelling atmospheric radiance. Homogeneous path transmittances were calculated for selected bands of CO, CO2, and N2O and compared with experimental measurements. The upwelling radiance and signal change in the wave number interval of the CO fundamental band were also calculated. Author

N76-27747*# Kanner (Leo) Associates, Redwood City, Calif.
IODINE AND BROMINE AS HYDROGEOCHEMICAL INDICATORS OF HYDROCARBONS IN THE MESOZOIC AND PALEOZOIC DEPOSITS OF NORTH POLAND
L. Bojarski Washington NASA Jun. 1976 30 p refs Transl. into ENGLISH from Kwart. Geol. (Poland), vol. 10, no. 1, 1966 p 177-193
(Contract NASw-2790)
(NASA-TT-F-17102) Avail: NTIS HC $4.00 CSCL 08G

Increased contents of biophile elements found in subsurface brinewater are a very important factor in the search for crude oil, and it is assumed that brines containing more than 1 mg/l iodine and more than 100 mg/l bromine characterize a contact zone with hydrocarbon deposits. Data are presented which indicate that considerable amounts of iodine and bromine occur in the northern lowland areas of Poland, encompassing the Peribaltic syneclise, the Mazury-Suwalki elevation, the Pomeranian synclinorium and the Pomeranian anitclinorium. It is shown that the most promising deposits are Jurassic and Middle Bunter sandstone period deposits, which occur in the Pomeranian synclinorium, where the iodine content varies from 8.7 to 27.5 mg/l. In the Bunter sandstone brines encountered in the Western part of the Pomeranian synclinorium, the bromine concentration is as high as 2,000 mg/l, thus being one of the highest concentrations in the world. Author

N76-27748*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
ENVIRONMENTAL DYNAMICS AT ORBITAL ALTITUDES Final Technical Report
Gerald R. Karr Jun. 1976 146 p refs
(Contract NAS8-28248)
(NASA-CR-149932; UAH-RR-186) Avail: NTIS HC $6.00 CSCL 04A

The influence of real satellite aerodynamics on the determination of upper atmospheric density was investigated. A method of analysis of satellite drag data is presented which includes the effect of satellite lift and the variation in aerodynamic properties around the orbit. The studies indicate that satellite lift may be responsible for the observed orbit precession rather than a super rotation of the upper atmosphere. The influence of simplifying assumptions concerning the aerodynamics of objects in falling sphere analysis were evaluated and an improved method of analysis was developed. Wind tunnel data was used to develop more accurate drag coefficient relationships for studying altitudes between 80 and 120 Km. The improved drag coefficient relationships revealed a considerable error in previous falling sphere drag interpretation. These data were reanalyzed using the more accurate relationships. Theoretical investigations of the drag coefficient in the very low speed ratio region were also conducted. Author

N76-27749*# Scientific Translation Service, Santa Barbara, Calif.
GEOCHEMICAL STUDY OF BRINES FROM OIL AND GAS FIELDS IN JAPAN
Y. Sudo Washington NASA Jul. 1976 31 p refs Transl. into ENGLISH from J. Jap. Ass. Petrol. Technol. (Tokyo), vol. 32, no. 5, 1967 p 286-296
(Contract NASw-2791)
(NASA-TT-F-17103) Avail: NTIS HC $4.00 CSCL 08G

Investigations of subsurface water were carried out in the main oil and gas fields of Japan. It is found that dissolved hydrocarbons and naphthenic acids in brine are direct indices, and I - and HCO3 are indirect indices, for oil and gas deposits. Author

N76-27750*# Scientific Translation Service, Santa Barbara, Calif.
IODINE IN OIL AND GAS FIELDS: ESPECIALLY ON THE GEOCHEMICAL CONSIDERATION OF THE PROSPECTING FOR IODINE DEPOSITS
K. Motojima Washington NASA Jul. 1976 38 p refs Transl. into ENGLISH from Bull. Geol. Surv. Jap. (JAPAN), vol. 22, no. 10 p 25-40
(Contract NASw-2791)
(NASA-TT-F-17104) Avail: NTIS HC $4.00 CSCL 08G

Iodine contents in brines of gas and oil fields throughout the world are surveyed from the standpoint of water quality and Cl content, and brines from oil, gas, and coal fields in Japan are studied in terms of Cl content. The distribution of iodine and halogens and their relationship in underground waters and the relationship between iodine and organic substances are discussed. Conclusions pertaining to geochemical prospecting are presented. Author

N76-27751*# Transemantics, Inc., Washington, D.C.
POLAR AURORA IN THE MAGNETOSPHERE
Yu. I. Galperin NASA Jul. 1976 83 p Transl. into ENGLISH of the book "Polyarnyye Siyaniya v magnitosfere" Moscow, Znaniye Press, 1975 p 1-64
(Contract NASw-2792)
(NASA-TT-F-17106) Avail: NTIS HC $5.00 CSCL 04A

The study of physical processes in the near-earth plasma has held and holds an important place in programs of space research. The causes of appearance of hot plasma in the magnetosphere, its movement, heating and the absorption of its energy in the upper atmosphere, which cause the Polar Aurorae and magnetic storms are described. Also decribed are various experiments conducted for the study of these phenomena. Specifically, descriptions are given of the latest results of the experimental study of the magnetospheres of other planets Mercury, Mars, and Jupiter - as well as certain hypotheses regarding the characteristics of the structure of the as yet inaccessible magnetosphere of Saturn and Uranus. Reference is made to U.S. Space Programs and U.S.S.R. Space Programs where applicable. The information that is presented is intended for specialists, teachers and students of higher educational institutions, public school teachers, as well as all those interested in studying space. Author

N76-27752*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TERRESTRIAL KILOMETRIC RADIATION: 2-EMISSION FROM THE MAGNETOSPHERIC CUSP AND DAYSIDE MAGNETOSHEATH
Joseph K. Alexander and Michael L. Kaiser Jun. 1976 28 p refs Submitted for publication
(NASA-TM-X-71152; X-695-76-139) Avail: NTIS HC $4.00 CSCL 04A

Measurements of the location of sources of terrestrial kilometric radiation obtained with the lunar orbiting Radio Astronomy Explorer-2 satellite have revealed a class of emission associated with the cusp and dayside magnetosheath. At frequencies near 250 kHz this emission is observed at radial distances between 2 and 20 R sub E at magnetic latitudes of 75 deg to 80 deg and is most often detected during periods of auroral activity (AE > or approximately = 250) and southward orientation of the interplanetary magnetic field vertical component. During very disturbed times, the emission at the lowest frequencies (< or approximately = 200 kHz) appears to come from the dayside magnetosheath at distances > or approximately = 12 R sub E. Whenever the geomagnetic dipole is tilted significantly with respect to the ecliptic pole (> or approximately = 10 deg) the cusp emission is confined to the hemisphere containing the sub solar point. The measurements also suggest that the region of cusp emission is rather narrowly confined in longitude to within + or - a few hours of the noon meridian. Author

N76-27753*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.

IONOSPHERIC E-REGION ELECTRON DENSITY AND NEUTRAL ATMOSPHERE VARIATIONS
Terrence L. Stick Aug. 1976 48 p refs
(Grant NGL-39-009-003)
(NASA-CR-148456; PSU-IRL-SCI-443) Avail: NTIS HC $4.00 CSCL 04A

Electron density deviations from a basic variation with the solar zenith angle were investigated. A model study was conducted in which the effects of changes in neutral and relative densities of atomic and molecular oxygen on calculated electron densities were compared with incoherent scatter measurements in the height range 100-117 km at Arecibo, Puerto Rico. The feasibility of determining tides in the neutral atmosphere from electron density profiles was studied. It was determined that variations in phase between the density and temperature variation and the comparable magnitudes of their components make it appear improbable that the useful information on tidal modes can be obtained in this way. Author

N76-27754*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON ESTIMATING GRAVITY ANOMALIES: A COMPARISON OF LEAST SQUARES COLLOCATION WITH LEAST SQUARES TECHNIQUES
P. Argentiero and B. Lowrey Jun. 1976 13 p refs Submitted for publication
(NASA-TM-X-71149; X-932-76-126) Avail: NTIS HC $3.50 CSCL 08N

The least squares collocation algorithm for estimating gravity anomalies from geodetic data is shown to be an application of the well known regression equations which provide the mean and covariance of a random vector (gravity anomalies) given a realization of a correlated random vector (geodetic data). It is also shown that the collocation solution for gravity anomalies is equivalent to the conventional least-squares-Stokes' function solution when the conventional solution utilizes properly weighted zero a priori estimates. The mathematical and physical assumptions underlying the least squares collocation estimator are described, and its numerical properties are compared with the numerical properties of the conventional least squares estimator. Author

N76-27755*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SPACECRAFT-BORNE GRADIOMETER MISSION ANALYSIS
P. Argentiero and R. Garza-Robles Washington Jul. 1976 23 p refs
(NASA-TN-D-8287; G-7685) Avail: NTIS HC $3.50 CSCL 08N

Numerical simulations were performed to obtain the orbit- and attitude-determination requirements of a spacecraft-borne gradiometer mission. Results demonstrated that position determination of 300 meters in the along-track and cross-track directions and 50 meters in the radial direction are mission requirements. The optimal orientation of the gradiometer sensing plane is achieved when the spin vector elevation is 0 degrees. The attitude-determination requirements are 5 degrees resolution for spin-vector azimuth and 0.2 degree resolution for spin-vector elevation. When these requirements are met, 3-degree gravity anomalies can be recovered globally with an accuracy of 0.025/mm/sq s (2.5 mgals). The Appendix documents the mathematical procedures for estimating detailed gravity fields from gradiometer data. Author

N76-27756*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON ESTIMATING GRAVITY ANOMALIES FROM GRADIOMETER DATA
P. Argentiero and R. Garza-Robles Washington Jul. 1976 20 p refs
(NASA-TN-D-8286; G-7684) Avail: NTIS HC $3.50 CSCL 08N

The Gravsat-gradiometer mission involves flying a gradiometer on a gravity satellite (Gravsat) which is in a low, polar, and circular orbit. Results are presented of a numerical simulation of the mission which demonstrates that, if the satellite is in a 250-km orbit, 3- and 5-degree gravity anomalies may be estimated with accuracies of 0.03 and 0.01 mm/square second (3 and 1 mgal), respectively. At an altitude of 350 km, the results are 0.07 and 0.025 mm.square second (7 and 2.5 mgal), respectively. These results assume a rotating type gradiometer with a 0.1 -etvos unit accuracy. The results can readily be scaled to reflect another accuracy level. Author

N76-27757# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
TRANSPORT PROCESSES AND TRACE CONSTITUENTS IN THE STRATOSPHERE Final Report, 1 May 1972 - 30 Sep. 1975
D. M. Cunnold and F. N. Alyea 1975 27 p refs
(Contract AT(11-1)-2249)
(COO-2249-5) Avail: NTIS HC $5.00

A three-dimensional dynamical-chemical model of the stratosphere was developed. The model includes predictions not only of the dynamical structure of the stratosphere but also of atmospheric ozone. A three year integration of this model has produced seasonal and latitudinal variations of the zonal wind and of columner ozone which are similar to those observed. Additional model calculations have included the steady state nitrogen dioxide distributions resulting from a source of 1.8 million tons/year inserted at various locations in the lower stratosphere. It is thus concluded that the most significant effect of a large fleet of SST's producing such an injection of NO2 is to deplete total atmospheric ozone by of order 10 percent. The latitudinal structure of this ozone depletion for various source locations is compared. Author (ERA)

N76-27758# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany). Inst. fuer Stratosphaerenphysik.
A MULTISATELLITE STUDY OF AURORAL ZONE PHENOMENA. PART 2: OBSERVATIONS DURING A SUBSTORM PERIOD ON 11 NOVEMBER 1969
L. Rossberg, J. R. Burrows (Natl. Res. Council, Ottawa), E. Kirsch, J.W. Muench, W. Riedler (Tech. Hochschule Graz), M. Scholer (Max-Planck-Inst. fuer Extraterrest. Phys., Garching, West Ger.), G. R. Thomas (Appleton Lab.), and T. Wedde (Univ. of Calif., San Diego) Apr. 1976 70 p refs
(ESA-SR-25) Avail: NTIS HC $4.50

Observations of electrons and protons over the auroral zone, the interplanetary magnetic field direction and the magnetic activity and cosmic noise absorption are used to study the changing disturbance pattern during a typical substorm period on 11 November 1969. The results are compared with the magnetically less disturbed period from 00 to 10 UT on the same day. It is demonstrated that the magnetic substorm can be used to determine the maximum phase of the magnetospheric activity but neither the onset nor the end. Author (ESA)

N76-27759# Centre National d'Etudes Spatiales, Toulouse (France). Div. Systemes et Projets Scientifiques.
SPACELAB BORNE LIDAR FOR ATMOSPHERIC RESEARCH, PHASE A STUDY. VOLUME 1: SYSTEMS ANALYSIS Final Report
10 May 1976 115 p 2 Vol.
(Contract ESTEC-2437/75-PP)
(DSES/SP/SC-76/LI/173-Vol-1; ESA-CR(P)-811-Vol-1) Avail: NTIS HC $5.50

A systems analysis of Spacelab borne lidar for atmospheric research is presented. Analysis of four configuration options led to the recommendation that the whole lidar should be placed on the pallet. System study topics include constitutive elements of a lidar system, parametric study, optical system study, laser subsystem specifications, calibration, synchronization, lasers and detectors package, scientific results achievement study, and facility concept. ESA

N76-27760# Centre National d'Etudes Spatiales, Toulouse (France). Div. Systemes et Projets Scientifiques.
SPACELAB BORNE LIDAR FOR ATMOSPHERIC RESEARCH, PHASE A STUDY. VOLUME 2: SUBSYSTEMS DESIGN AND SPACELAB INTERFACES Final Report
10 Jun. 1976 218 p 2 Vol.
(Contract ESTEC-2437/75-PP)
(DSES/SP/SC-76/LI/173-Vol-2; ESA-CR(P)-811-Vol-2) Avail: NTIS HC $7.75

Subsystems design aspects and interfaces with the space

laboratory of the Spacelab borne lidar for atmospheric research projects are presented. Subsystem design aspects include laser, telescope, support structures, transmitting optics, secondary optics, alignment, synchronization, detectors package, safety design, and lidar budgets. Spacelab interfaces dealt with are mechanics, thermics, optics, electricity/electronics, electromagnetic compatibility, lidar management, contamination, orbits, and safety. ESA

N76-27761# Computer Corp. of America, Cambridge, Mass.
DATACOMPUTER SUPPORT OF SEISMIC DATA ACTIVITY Quarterly Technical Report, 1 May - 31 Jul. 1975
31 Jul. 1975 19 p
(Contract MDA903-74-C-0227; ARPA Order 2613)
(AD-A019897) Avail: NTIS CSCL 08/11

The purpose of this project is to support the ARPA-NMRO Seismic Data Activity by providing data storage and retrieval services. The Arpanet will be used as the primary communications channel. As part of the service, seismic data will be (1) received from the Arpanet; (2) stored and indexed in the Datacomputer; and (3) made available to computers on the Arpanet in a convenient and timely manner. These services represent a special application of the Arpanet Datacomputer being developed and maintained by Computer Corporation of America (CCA) under contract. GRA

N76-27762# Computer Corp. of America, Cambridge, Mass.
DATACOMPUTER SUPPORT OF SEISMIC DATA ACTIVITY Quarterly Technical Report, 1 Aug. - 31 Oct. 1975
31 Oct. 1975 19 p
(Contract MDA904-74-C-0227; ARPA Order 2613)
(AD-A019961) Avail: NTIS CSCL 08/11

The purpose of this project is to support the ARPA-NMRO seismic data activity by providing data storage and retrieval services. The Arpanet will be used as the primary communications channel. As part of the service, seismic data will be (1) received from the Arpanet; (2) stored and indexed in the Datacomputer; and (3) made available to computers on the Arpanet in a convenient and timely manner. The amount of seismic data to be stored requires the addition of a mass memory to the Datacomputer system. An Ampex Terabit Memory System (TBM) with a capacity of almost two hundred billion bits will be installed at CCA in January 1976 to answer this need. The other hardware item vital to this project, besides the TBM, is a small Seismic Input Processor (SIP). GRA

N76-27763# Development and Resources Transportation Co., Silver Spring, Md.
POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING Final Report
Leonard A. LeSchack Mar. 1975 33 p refs
(Contract NOAA-3-35384)
(PB-250490/0; NOAA-76012705) Avail: NTIS HC$4.00 CSCL 08L

An approach to automated mapping of the thickness and movement of Arctic ice by means of statistical examination of NOAA VHRR satellite IR data is discussed. Data are examined so that it is now possible to outline the basic steps for implementing an algorithm to automate ice mapping. Five passes made by NOAA-2 and NOAA-3 satellites were used for the analysis. These passes provided radiant temperature data of the Beaufort Sea ice during January, February, March, April, and May 1974. Examination of the shapes of the temperature distribution histograms derived from the data suggested differences that could be delineated by simple statistical techniques. GRA

N76-27764# Emmanuel Coll., Boston, Mass.
STUDY OF HYDROMAGNETIC WAVE PROPAGATION IN THE MAGNETOSPHERE Final Report, 1 Apr. 1973 - 31 Jul. 1975
William F. Bellew, Charles J. Cantor, and M. Patricia Hagan Nov. 1975 121 p
(Contract F19628-73-C-0081; AF Proj. 7601)
(AD-A020301; AFCRL-TR-75-0588) Avail: NTIS CSCL 09/2

This report details the specifications of the minicomputer located at AFCRL, which has been installed for data reception in the MAGAE (Micropulsation Analysis for Geomagnatic Activity Forecasting) network. Further, mathematical analyses of magnetospheric models are paresented, together with computer programs written to produce theoretical results for anticipated network problems. GRA

N76-27765# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
RESPONSE OF THE MAGNETOSPHERE AND ATMOSPHERE TO THE SOLAR WIND Final Report, Jul. 1972 - Sep. 1975
W. P. Olson, K. A. Pfitzer, and O. K. Moe Dec. 1975 119 p refs
(Contract F44620-72-C-0084; AF Proj. 9751)
(AD-A020659; AFOSR-76-0083TR) Avail: NTIS CSCL 04/1

The general goal of this contract was to obtain a better quantitative understanding of the interaction of the solar wind with the magnetosphere and atmosphere. Several scientific goals were formulated and met. They included the fabrication of quantitative models of the shape and location of the dayside cusps, the total magnetospheric magnetic field, and of total neutral atmospheric density. These models, together with others developed or under developement with other DoD support, should provide a first set of software capable of being used to specify environmental behavior, with emphasis being given to those aspects which influence the performance of hardware systems. GRA

N76-27766# Intelcom Rad Tech, San Diego, Calif.
NEW ATOMIC BEAM STUDIES AT LOW ENERGIES Final Report
R. H. Neynaber, J. A. Rutherford, and D. A. Vroom 8 Oct. 1975 78 p refs
(Contract DNA001-75-C-0042; DNA Proj. NWED-QAXHD010)
(AD-A020630; INTEL-RT-8120-008; DNA-3720F) Avail: NTIS CSCL 04/1

Final cross sections have been obtained for charge transfer between the ions O(+) and N(+) and the neutral atoms uranium and thorium. In the course of these measurements, cross sections were also obtained for some of the other charge transfer reactions. A second task completed was the measurement of cross sections for the reaction of Al(+) with molecular nitrogen and oxygen. Attempts were made to measurem cross sections for other processes involving these reactants but no measurable signals could be detected. A final set of experiments involved a search for a route for formation of H3O(+) using NO(+) as a precursor. No conclusive evidence for such a process could be found in the energy range covered by the experiments. GRA

N76-27767# Germantown Labs., Inc., Philadelphia, Pa.
CHEMICAL RELEASE PAYLOADS FOR OPERATION POST ALADDIN 74, OPERATION AEOLUS AND OPERATION HARSES SMOKE 2 Final Report, 9 Dec. 1974 - 30 Jun. 1975
Charles S. Stokes, William J. Murphy, and Edward W. Smith 31 Aug. 1975 40 p refs
(Contract F19628-75-C-0106)
(AD-A020541; AFCRL-TR-75-0625) Avail: NTIS CSCL 04/1

This report covers the work performed in support of the chemical payloads for Operation Post Aladdin 74, January 1975 launch series from NASA Wallops Station, Virginia, Operation Aeolus April 1975 launch series from the Canadian Research Range, Churchill, Canada and Operation Harses (Smoke II) June 1975 launch series from White Sands Missile Range, New Mexico. These operations included design, fabrication, assembly and launch services for payload modules containing barium thermite, trimethyl aluminum, tetraethyl lead, nitric oxide, aluminum thermite and titanium tetrachloride-methanol/water release. GRA

N76-27768# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
UNIFIED MODEL OF AURORAL SUBSTORM DEVELOPMENT Final Report, 1 Jul. 1973 - 30 Jun. 1975
Robert L. Carovillano, George L. Siscoe, Robert E. Sheehan, Robert H. Eather, and M. Susan Gussenhoven 31 Aug. 1975 198 p refs
(Contract F19628-74-C-0015; AF Proj. 8666)
(AD-A020313; AFCRL-TR-75-0558) Avail: NTIS CSCL 04/1

The primary data base for this report on auroral substorm phenomena included DAPP DMSP satellite images of auroras, selected mid- and high-latitude ground-based magnetograms, and

newly developed ground-based photometric measurements of auroral emissions of great sensitivity. Extensive morphological and topological studies were made from the DAPP/DMSP images. An auroral activity index was developed and statistical correlations with magnetic indices determined. The persistence of aurora, and auroral zone, and the relationships between auroral activity with substorms and mid-latitude magnetic signatures were developed from satellite images. Models were developed from satellite images using midlatitude magnetograms to detect substorm occurrence. The photometric studies gave new information on the location of particle injection at substorm onset and on morphological characteristics of auroras in local time. The advantages of X-ray monitoring of the ionosphere from a polar orbiting satellite are described and statistics of the solar wind electric field determined. GRA

N76-27769# Arizona Univ., Tucson.
CLIMATIC MODELING OF THE EARTH-ATMOSPHERE SYSTEM Final Report, 1 Jul. 1970 - 31 Dec. 1975
William D. Sellers 31 Dec. 1975 31 p refs
(Contract DAHC04-70-C-0038)
(AD-A020458; ARO-9077.6-EN) Avail: NTIS CSCL 04/1

During the course of this research three global climate models (I, II, and III) have been developed. The first two are vertically-integrated and use a grid spacing of 10 deg of latitude in the north-south direction. Model I differentiates zonally only between land and water. Model II uses a zonal grid of 10 deg of longitude and is the only one of the models to include a hydrologic cycle and variable cloud cover. Model III is a two-dimensional zonally-averaged model with a grid spacing of 7.5 deg of latitude horizontally and 3 km vertically (10 layers). Each model has its own advantages and disadvantages. Model I is probably the most practical to use in studies of climatic change. The model is fast, requiring very little computer time, and reproduces the present climate of the earth quite well. Models II and III should both be improved considerably before being used in studies of climatic change. Author (GRA)

N76-27770# Arcon Corp., Wakefield, Mass.
IONOSPHERIC ANALYSIS AND IONOSPHERIC MODELING Interim Report
David C. Miller and Joseph Gibbs Jul. 1975 89 p refs
(Contract F19628-74-C-0070; AF Proj. 5631)
(AD-A020272; AFCRL-TR-75-0549; SR-2) Avail: NTIS CSCL 04/1

A global ionospheric model of the ionosphere was developed which allows for the incorporation of hourly observations of ionospheric parameters. A polar ionospheric model for foF2 was developed which contains corrections to a median model which are characteristic of the polar region. Improvements in ionospheric ray tracing techniques are described including the development of a homing procedure. GRA

N76-27771# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
RADAR REFRACTION COMPUTATIONS USING DIGITAL VERTICAL-INCIDENCE IONOGRAMS Interim Report
Raymond J. Cormier and Kenneth Dieter 22 Oct. 1975 20 p refs
(AF Proj. 5631)
(AD-A020353; AFCRL-TR-75-0560; AFCRL-AFSG-330) Avail: NTIS CSCL 04/1

Highly accurate radars, such as those used in space-track and missile-tracking applications, may have a need for real-time radar refraction corrections. This requires the handling of large amounts of data which is a cumbersome and time-consuming effort. Real-time ionospheric-refraction correction requires the availability of real-time ionospheric profiles. This report describes a technique to obtain radar refraction-corrections and excess angular-phase-paths, in near real-time. This technique is an extension of the automatic digital-ionogram processing technique. Examples are given to show the variation of the radar refraction correction with operating frequency and zenith angle for several ionospheric true-height profiles. GRA

N76-27772# RAND Corp., Santa Monica, Calif.
THE EFFECT OF REDUCING THE SOLAR CONSTANT IN A CLIMATE MODEL
F. Haurwitz Jul. 1975 13 p refs
(AD-A020147; P-5448) Avail: NTIS CSCL 04/1

Considerable interest and concern has arisen as to how the world's climate may be changing. At the same time and, in part, as a result of this, a substantial effort has been made to develop a variety of numerical models designed to simulate the climate. The report discusses experiments which involve the altering of the solar constant. GRA

N76-27773# Texas Univ. at Dallas, Richardson.
AURORAL DATA ANALYSIS Final Report, 1 Sep. 1974 - 30 Sep. 1975
J. Winningham 30 Sep. 1975 43 p refs
(Contracts F19628-75-C-0032; F19628-72-C-0230; AF Proj. 7663)
(AD-A020300; AFCRL-TR-75-0404) Avail: NTIS CSCL 04/1

Data from soft particle spectrometers on the ISIS-1 and -2 satellites, and a sounding rocket have been analyzed and compared with other observations to reveal their relation to auroral, magnetospheric, and ionospheric effects. Comparison of concurrent ground and interplanetary magnetic field data with ISIS-1 cleft data revealed the cleft position to be sensitive to changes in both AE and B sub z. Concurrent plasma, particle, and field data from a sounding rocket launched into the cleft demonstrated the cleft to be a region of complex physical interactions. Electron temperature and density enhancements were observed in the cleft as well as changes in the convection pattern. This flight also demonstrated that a bottomside ionosonde is a useful tool to determine the cleft's equatorward boundary, even in full sunlight. All-sky-camera data shows that a distinct fade occurs in auroral arcs prior to the brightening characteristics of the initiation of a substorm. Detailed comparison of aircraft and satellite data taken during a period of magnetic quiescence revealed that the region of auroral particle precipitation coincides with the region of diffuse aurora. Electron density and scale height increased within the auroral precipitation band as did fluctuations in density. An empirical relation was derived that relates electron energy flux to 6300 A fluxes exist in and poleward of the cleft. GRA

N76-27774# Tri-Con Associates, Inc., Cambridge, Mass.
THE DESIGN, DEVELOPMENT AND TEST OF A ROCKET PAYLOAD TO MEASURE ATMOSPHERIC DENSITY Final Report, 28 Jun. 1973 - 30 Jun. 1975
William B. Huber 20 Oct. 1975 58 p
(Contract F19628-74-C-0023; AF Proj. 6690)
(AD-A020274; AFCRL-TR-75-0552; C-130) Avail: NTIS CSCL 04/1

Rocket-borne instrumentation to measure atmospheric density in the 100 KM to 200 KM altitude region was designed, fabricated, and tested. The instrumentation employed two pulsed 4.5 Kev electron beams each with an average current of one milliampere. Observation of the beam induced bremsstrahlung was made with two proportional counters with krypton gas fill and 2 mil beryllium windows, in the 1.0 to 4.5 Kev X-ray region. Ultra-violet fluorescence was observed with three 3,914 A photometers and associated logarithmic electrometers. In order to measure vehicle charge, a planar retarding potential analyzer was employed. The sensor specifications and the electrical design of the payload are described. GRA

N76-27775# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
GLOBAL DISTRIBUTION OF HIGH-ALTITUDE OZONE FROM A UV SPECTROMETER Interim Report
Lawrence R. Sharp and Hugo R. Rugge 14 Jul. 1975 39 p refs
(Contract F04701-75-C-0076)
(AD-A013694; SAMSO-TR-75-177; TR-0076(6960-04)) Avail: NTIS CSCL 04/1

A satellite-based UV spectrometer that obtained daytime earth radiance measurements in the 1700- to 3100-A region is described. Radiance and earth albedo data are displayed, and a list of available data is provided. A parameter related to the relative high-altitude (h= or > 35 km) ozone concentration is correlated with solar zenith angle, time, and geographic position. GRA

N76-27776# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HIGH ALTITUDE EFFECTS SIMULATION (HAES) PROGRAM. REPORT NO. 23: INSTRUMENTATION ANALYSIS AND DATA PROCESSING FOR ROCKETBORNE LWIR SPECTROMETERS WITH APPLICATION TO ROCKET A18.006-2 OF 22 MARCH 1973 Environmental Research Papers
James W. Rogers 8 Oct. 1975 46 p refs
(DNA Proj. NWET-K11BAXHX534)
(AD-A020810; AFCRL-TR-75-0535; AFCRL-ERP-539) Avail: NTIS CSCL 04/1

A liquid-helium-cooled long-wavelength infrared spectrometer was successfully launched on 22 March 1973 from the Poker Flats Research Facility, Alaska. This spectrometer, which employed a circular variable filter (CVF), was developed over a period of five years and provided the first measurements of the infrared spectrum of the upper atmospheric emissions between 7 and 24 micrometers. The data processing proceeded in a step-by-step manner to provide accurate final data with error limits and an understanding of the spectrometer performance. Each step of the data processing is presented in this report which will provide engineers with information on the spectrometer performance and data analysts with the basis for the final assignment of error limits. Similar procedures can also be used for the data reduction of other CVF flights. GRA

N76-27777# Alaska Univ., College. Geophysical Inst.
INVESTIGATION OF THE PHENOMENOLOGY OF THE ARCTIC IONOSPHERE AND ITS RELATION TO THE PHENOMENOLOGY OF ARCTIC PARTICLE PRECIPITATION Final Report, 1 May 1972 - 30 May 1975
S.-I. Akasofu Jun. 1975 45 p refs
(Contract F19628-72-C-0301; AF Proj. 5631; AF Proj. 7663)
(AD-A020992; AFCRL-TR-75-0349) Avail: NTIS CSCL 04/1

The feasibility of predicting and monitoring the occurrence and intensity of the magnetospheric substorm were examined on the basis of DMSP photographs and the concurrent interplanetary magnetic field data. GRA

N76-27778# Army Electronics Command, Fort Monmouth, N.J.
THE DIURNAL VARIATION OF MIXING HEIGHT BY MONTH OVER WHITE SANDS MISSILE RANGE, NEW MEXICO Research and Development Report, 1961 - 1972
Colburn Norton and Glenn Hoidale Nov. 1975 46 p refs
(DA Proj. 1T1-61102-B-53ASA)
(AD-A020741; ECOM-5579) Avail: NTIS CSCL 04/1

An important tool in the evaluation of the dispersion potential of the atmosphere is the mixing height. Quartiles representing the diurnal variation of mixing height over White Sands Missile Range, NM, are displayed graphically and listed tabularly by month. The data are based on 8,236 radiosonde observations taken during the period of 1961 through 1972. Author (GRA)

N76-27779# Athens Univ. (Greece). Electronic Div.
THE TEC MEASUREMENTS OVER ATHENS, GREECE STATION Interim Scientific Report, 1 May 1973 - 30 Apr. 1974
Dimitris A. Matsoukas Jun. 1975 16 p refs
(Grant AF-AFOSR-2347-72; AF Proj. 4643)
(AD-A020965; AFGL-TR-76-0008; ISR-2) Avail: NTIS CSCL 04/1

The total electron content of the ionosphere during the minimum of solar cycle has been studied. The day-time maximum electron content is greater during the equinoxes particularly during the autumn period. The night time minimum presents its great value during the summer period. The electron content starts to increase 1 hour after sun-rise at the 300 km height. This time delay is different from season to season and is smallest in the winter. The rate of increase is at its greatest in the three hours following the morning minimum, the rate of decrease after the daytime maximum is rather irregular. Author (GRA)

N76-27780# Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
SEISMIC VERIFICATION OF MIXED EVENTS Final Report, 1 Apr. 1974 - 1 Apr. 1975
Bernard Harris 15 Nov. 1975 175 p refs
(Contract F44620-74-C-0066; ARPA Order 1827)
(AD-A020591; OAS-TR-75-271; AFOSR-76-0038TR) Avail: NTIS CSCL 17/10

The limitations of polarization and azimuthal filters for sorting mixed event seismic signals was quantified and a combined data processing technique, the ellipticity filter, was proposed. The algorithms for instrumenting the ellipticity filter concept for both noise-free and noise-present models were developed. The superiority of the ellipticity filter, however, requires the accurate calibration of the seismological stations. This problem was experimentally examined and the differences of the seismic instrumentation noted. Since considerable improvements in the VLP seismological stations have been recently achieved, it is recommended that the ellipticity filter technique be tested using current data. GRA

N76-27781# Stanford Research Inst., Menlo Park, Calif.
USE OF INFRARED RADIANCE MEASUREMENTS IN DYNAMIC ANALYSIS Final Report, Jul. 1974 - Sep. 1975
Paul A. Davis Oct. 1975 71 p refs
(Contract N66314-74-C-2350; SRI Proj. 3529)
(AD-A020689; EPRF-TR-10-75-SRI) Avail: NTIS CSCL 04/1

Sets of special upper-air observations on both mesoscales and synoptic scales over land were subjected to isentropic analyses to define tropospheric distributions of mass divergence and the rates of change of temperature-pressure gradients. Profiles of temperature and humidity were used to compute radiances corresponding to those measured by profile radiometers aboard NOAA satellites. A study was made of the feasibility of inferring tropospheric mass divergence from multispectral radiance changes associated with the temperature-pressure changes. GRA

N76-27782# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
THE EFFECT OF BANDPASS FILTERS ON LASA DETECTION PERFORMANCE
Andre C. Chang and Raymond M. Seggelke 31 Jul. 1975 26 p refs
(Contract F08606-76-C-C0004; ARPA Order 2551;
VT Proj. 6709)
(AD-A020315; SDAC-TR-75-9) Avail: NTIS CSCL 17/10

On-line testing at the SDAC of short-period automatic detection filters 0.9-1.4 Hz, 0.9-1.8 Hz, 0.8-1.8 Hz, and 0.8-2.5 Hz reveals no statistically significant differences in the number of events reaching the LASA summary bulletin. Almost all detection processor detections which do not reach the summary bulletin are due to multiple picks on regional events. Therefore, a substantial lowering of the analyst workload or a substantially lowered threshold would be possible if a reliable procedure could be developed for flagging detections due to regional events. An excellent correlation has been found between the number of events per hour which reach the summary bulletin, and the hourly noise level. Author (GRA)

N76-27783# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
STRATOSPHERIC TRACE GAS MEASUREMENTS Final Report
Theodore J. Pepin Dec. 1975 29 p refs
(Contract N00014-70-A-0266-0009; NR Proj. 211-173)
(AD-A020804; App-2) Avail: NTIS CSCL 04/1

Investigations were conducted to study the feasibility of extending the high altitude balloon solar extinction measurements that were previously developed under ONR sponsorship into the infrared region of the spectrum to allow for the study of stratospheric trace gases. Topics discussed include the stratospheric aerosols, radiation balance of earth, gases concerned with ozone, the pointing system, the detector system, and the telemetery system. GRA

N76-27784# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
WYOMING PAM PROJECT (PRELIMINARY AEROSOL MEASUREMENTS) Final Report
Theodore J. Pepin Sep. 1975 7 p Sponsored in part by DOT
(Contract N00014-70-A-0266-0008)
(AD-A020803; App-1) Avail: NTIS CSCL 04/1

In 1971 the University of Wyoming undertook the Wyoming

PAM Project, a project designed to build a radiometric instrument to be placed on an Air Force:satellite. The purpose of the PAM experiment was to provide first-look type of information from space on the concentration and verticle profile of aerosol particles in the stratosphere. During the project, the University of Wyoming constructed and built two models of the preliminary aerosol measurement package. These particular models were tested, and one of the models was designated as a flight model. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N76-27785*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LUMINOUS ELECTRICAL PHENOMENA IN HUNTSVILLE, ALABAMA, TORNADOES ON APRIL 3, 1974
Otha H. Vaughan, Jr. and Bernard Vonnegut (New York St. Univ., Albany) May 1976 36 p refs Original contains color illustrations
(NASA-TM-X-73301) Avail: NTIS HC $4.00 CSCL 04B

Unusual lightning and varicolored luminous phenomena were observed on the evening of April 3, 1974, when severe tornadoes passed through Madison County, Alabama. Photographs and eyewitness accounts of this electrical activity are related to the trajectories of the tornadoes and the damage areas they produced. Author

N76-27786*# Transemantics, Inc., Washington, D.C.
METEOROLOGICAL RESEARCH
Ye. P. Borisenkov, ed. NASA Jul. 1976 133 p refs Transl. into ENGLISH of the book "Meteorologicheskiye Issledovaniya" Moscow, Nauka Press, 1975 p 1-68
(Contract NASw-2792)
(NASA-TT-F-17061) Avail: NTIS HC $6.00 CSCL 04B

Materials dealing with the utilization of meteorological satellites for the investigation of polar regions are presented. In one, light is thrown on questions pertaining to the use of microwave equipment for investigating Atlantic ice and for determining the temperature of the underlying surface, the use of television equipment for the determination of cloud and ice fields in the Arctic and Antarctic regions, as well as for the comprehensive analysis of landscapes. Also the use of data on departing radiation for the determination of average-temperature fields and the restoration of aerological data is discussed along with questions pertaining to identification and geographic control of the data. Author

N76-27787*# Physical Dynamics, Inc., Berkeley, Calif.
CONCEPTUAL DESIGN OF AN AIRBORNE LASER DOPPLER VELOCIMETER SYSTEM FOR STUDYING WIND FIELDS ASSOCIATED WITH SEVERE LOCAL STORMS Final Report
J. Alex Thomson, Alan R. Davies, and Klaus G. P. Sulzmann May 1976 157 p refs
(Contract NAS8-31724)
(NASA-CR-149933; PD-B-76-118) Avail: NTIS HC $6.75 CSCL 04B

An airborne laser Doppler velocimeter was evaluated for diagnostics of the wind field associated with an isolated severe thunderstorm. Two scanning configurations were identified, one a long-range (out to 10-20 km) roughly horizontal plane mode intended to allow probing of the velocity field around the storm at the higher altitudes (4-10 km). The other is a shorter range (out to 1-3 km) mode in which a vertical or horizontal plane is scanned for velocity (and possibly turbulence), and is intended for diagnostics of the lower altitude region below the storm and in the out-flow region. It was concluded that aircraft flight velocities are high enough and severe storm lifetimes are long enough that a single airborne Doppler system, operating at a range of less than about 20 km, can view the storm area from two or more different aspects before the storm characteristics change appreciably. Author

N76-27788# Stockholm Univ. (Sweden). Inst. of Meteorology.
ON THE BREAKDOWN OF THE WESTERLIES
Harald Lejenaes Dec. 1975 75 p refs
(Contracts G-2753-4; G-223-58)
(DM-17) Avail: NTIS HC $4.50

The dynamics of the ultralong Rossby waves were studied with the aid of a primitive numerical model. The investigation was focused on a study of the breakdown of a high-index circulation. Different idealized flow patterns were used as initial conditions and forecasts made with the numerical model. The influence of oceans and mountains was studied by incorporating them into the model. Results indicate that barotropic and baroclinic instabilities as well as the structure of the earth's surface are of importance in the development, but the experiments do not indicate clearly which of these factors is most important. Author (ESA)

N76-27789# World Meteorological Organization, Geneva (Switzerland).
RICE AND WEATHER
G. W. Robertson 1975 47 p refs
(WMO-423; TN-144; ISBN-92-63-10423-9) Avail: NTIS HC $4.00; WMO, Geneva Sw. Fr. 12

The present knowledge of the climatological factors defining areas suitable for the production of rain-fed, dryland rice and of the threshold values of the climatological factors which set limits on the profitable production of specified varieties of rice are reviewed. An extensive bibliography is appended. ESA

N76-27790# Royal Netherlands Meteorological Inst., De Bilt.
DURATION AND AVERAGE VELOCITY (RELATED TO VARIOUS VELOCITY LEVELS) OF STORMS AT DEN HELDER, VLISSINGEN AND DE BILT [DUUR EN GEMIDDELDE SNELHEID (T.A.V. DIVERSE SNELHEIDSNIVEAU'S) VAN STORMEN TE DEN HELDER, VLISSINGEN EN DE BILT]
P. J. Rijkoort and A. Denkema 1976 29 p In DUTCH
(KNMI-V-270) Avail: NTIS HC $4.00

Duration and average speed of extreme storms, as measured in Den Helder (1922-1970), Vlissingen (1910-1944) and De Bilt (1906-1960) were calculated. A storm is defined as a continuous period of at least 3 hours in which the hourly average wind speed is greater than or equal to 1.5 times the yearly average wind speed (6.6, 6.0 and 4.8 m/s for the above mentioned places) measured over a great number of years, whereas the maximum hourly average is greater than or equal to 2.5 times the yearly average wind speed. The final results are represented graphically. ESA

N76-27791# Royal Netherlands Meteorological Inst., De Bilt.
A NUMERICAL DATA STORAGE APPARATUS [EEN NUMERIEKE DATA OPSLAG AUTOMAAT]
J. J. M. VanGorp 1976 105 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-2) Avail: NTIS HC $5.50

Design principles and operation of a 50 channel automatic meteorological data acquisition system are reported. Continuous measurements of wind speed and direction, temperature, radiation, visibility, etc., taken from a 200 m high meteorological mast at Cabauw, the Netherlands, were recorded at 2 minute intervals starting October 1972, in the context of an experimental research program on meteorological processes in the planetary boundary layer. The following topics are described in detail: binary coding and data format; magnetic recording principles; sample theory and aliasing effect; response to external interference; and detection and correction of magnetic registration errors. Man machine codes, the magnetic recorder (Racal T5000), and a presentation of the registrations and preprocessing are discussed in annexes. ESA

N76-27792# Royal Netherlands Meteorological Inst., De Bilt.
PRECIPITATION, 1974
Jun. 1975 126 p In ENGLISH and DUTCH
(KNMI-117) Avail: NTIS HC $6.00; Roy. Neth. Meteorol. Inst. DFL. 10,

Monthly tables are presented containing the daily amount of precipitation together with the amount per decade and per month at all stations of the Royal Netherlands Meteorological

Institute where measurements were made in 1974. Average values of the amount of precipitation are included for stations at which measurements were made during the period 1931 to 1960. Total annual amounts are tabulated separately. ESA

N76-27793# Royal Netherlands Meteorological Inst., De Bilt.
MARINE CLIMATOLOGICAL SUMMARIES FOR THE MEDITERRANEAN AND THE SOUTHERN INDIAN OCEAN, VOLUME 5, 1965
Feb. 1975 475 p
(KNMI-151-5) Avail: NTIS HC $12.00; Roy. Neth. Meteorol. Inst. DFI. 25

Summaries are presented for eight areas of Mediterranean waters and thirteen of southern Indian Ocean and Australian waters. These summaries are based on observations made by voluntary observers on ships of various nations. Periodic variations of data on mean monthly position, amount of cloud, dry-bulb temperature, dew-point temperature, sea-surface temperature, air-sea temperature differences, wind, pressure, horizontal visibility, present weather, and waves are tabulated. ESA

N76-27794# Royal Netherlands Meteorological Inst., De Bilt.
VERIFICATION OF WIND AND STORM WARNING SERVICE. MIDDLE DISTRICT, 1964 - 1973 [VERIFICATIE WIND- EN STORMWAARSCHUWINGSDIENST. DISTRICT MIDDEN 1964 t/m 1973]
J. VanRaalten 1976 22 p In DUTCH
(KNMI-V-272) Avail: NTIS HC $3.50

A verification was made of wind and storm warning for the middle district in the Netherlands over the 10 year period 1964 through 1973. Estimated wind velocities were verified on the basis of the WMO - Beaufort scale. Announcement and hit percentages were calculated from predicted and observed wind forces. The results are discussed. ESA

N76-27795# Royal Netherlands Meteorological Inst., De Bilt.
THE RARENESS OF THE NUMBER OF DAYS WITH HIGH WIND VELOCITIES OVER THE SHALLOW SEA DURING THE PERIOD JUNE-SEPTEMBER 1974 [DE ZELDZAAMHEID VAN HET AANTAL DAGEN MET GROTE WINDSNELHEDEN IN DE WADDENZEE GEDURENDE HET TIJDVAK JUNI-SEPTEMBER 1974]
P. J. Rijkoort 1976 32 p refs In DUTCH
(KNMI-V-273) Avail: NTIS HC $4.00

As a result of the rare occurrence of days with a high wind velocity over the Shallow Sea (Netherlands), a statistically based probability estimate was calculated for the rareness of the observed frequency of high velocities in 1974. The problem occurred as a result of loss of working days due to unforeseen high winds. A method is described to determine the threshold transition probability related to the degree of unexpectedness of the circumstances. ESA

N76-27796# Royal Netherlands Meteorological Inst., De Bilt.
WIND AND TEMPERATURE PROFILES MEASURED DURING AIRCRAFT LANDINGS [WIND- EN TEMPERATUURPROFIELEN GEMETEN TIJDENS VLIEGTUIGLANDINGEN]
F. Cannemeijer 1976 31 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-6) Avail: NTIS HC $4.00

Wind and temperature profiles obtained from the Airborne Integrated Data System (AIDS) of DC-10 and B-747 aircraft during the descent stage are dealt with. These aircraft profiles are compared with profiles measured on a 200 m high meteorological tower. The descents were performed at Schiphol Airport, at a distance of approximately 40 km from the tower. The variability (in time and space) of the wind is discussed, partly on the basis of measurements of the wind speed at three levels (200, 80 and 10 m) of the meteorological tower. The way in which the wind speed and direction and the temperature were measured during the descent of the aircraft is demonstrated. The comparison of the wind and temperature profiles obtained from the AIDS with the half-hourly values measured on the meteorological tower is described. It is concluded that the wind speed and the wind direction as obtained from the AIDS appear to be reliable. The accuracy with which the wind speed is measured is estimated to be better than 1 m/s, while the wind direction can be measured with an accuracy better than 10 deg. Comparison of the temperature profiles indicates that the AIDS gives temperatures accurate within 0.5 C. Some remarks and recommendations are made for the use of the AIDS-profiles in the study of the atmospheric boundary layer and for the possible operational use of the profiles for the warning of marked temperature inversions and of the occurrence of wind shear. Author (ESA)

N76-27797# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12803A LANCE, MISSILE NO. 3195 RSL Meteorological Data Report
15 May 1975 19 p
(DA Proj. 1T6-65702-D-127)
(AD-A018608; DR-887) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12803A Lance, Missile Number 3195, Round Number 262 RSL, are presented in tabular form. GRA

N76-27798# Chicago Univ., Ill. Lab. for Atmospheric Probing.
RANDOM ERRORS IN WIND AND PRECIPITATION FALL SPEED MEASUREMENT BY A TRIBLE DOPPLER RADAR SYSTEM
Alan R. Bohne and R. C. Srivastava Oct. 1975 63 p refs Prepared jointly with Ill. Inst. of Tech.
(Grants NOAA-04-3-022-036; NSF DES-75-09683)
(PB-249679/2; TR-37; NOAA-76010703) Avail: NTIS HC $4.50 CSCL 04B

The equations and pictorial examples of the errors to be expected in the velocity components (u, v, w + V sub T) in a three Doppler radar system is presented as a function of certain radar parameters and positions. Discussion of expected errors in deduced divergence, vorticity, vertical air velocity, and precipitation fall velocity is given. The three and two Doppler radar systems are briefly compared. The derivations assume an infinitely narrow beam, however finite pulse volume size enters indirectly in the estimation of the actual error where the variance of the Doppler power spectrum is introduced. GRA

N76-27799# Oklahoma Univ., Norman.
DEVELOPMENT IN DOPPLER RADAR METEOROLOGY: TRANSMITTER MODIFICATION FOR TORNADO CLEAR AIR TURBULENCE DETECTION Final Technical Report
Gerald Tuma Nov. 1975 25 p
(Grant NOAA-04-3-022-21)
(PB-250146/8; NOAA-76010704) Avail: NTIS HC $3.50 CSCL 04B

Modifications to the B-units of the FPS-18A radar transmitter and achievement of various operational characteristics are described. Topics investigated include: the deionization time of the 500 ampere hydrogen thyratron switch tube; using low level excitation methods; response characteristics of the charging inductor, pulse forming network, hydrogen thyratron, and pulse transformer assembly; modifications to the trigger amplifier and final stage modulator; short pulse capability; a diode holding circuit permitting variable pulse repetition rate operation; and long pulse (6.6 microsec) capability. GRA

N76-27800# Environmental Data Service, Washington, D.C.
MARINERS WEATHER LOG, VOLUME 20, NUMBER 1, JANUARY 1976
Elwyn E. Wilson, ed. Jan. 1976 65 p refs
(PB-250014-01; NOAA-76012202-Vol-20-No-1) Avail: NTIS HC $4.50 CSCL 04B

The periodical contains three original articles, as well as regular features. The articles are: high waves in the Auglhas current; low-water storm of April 3-4 1975; the world of tropical cyclones, Australia-South Pacific Ocean. Regular features include a marine weather review, a marine weather diary, radio officer tips, and hints to the observer. A glossary of meteorological terms used in smooth logs, rough logs, and the marine weather diary is included. GRA

N76-27801# Naval Postgraduate School, Monterey, Calif.
A STUDY OF RECENT NUMERICAL METHODS FOR THE BAROTROPIC PRIMITIVE EQUATIONS Final Report, Apr. - Jul. 1975

Craig Comstock Jan. 1976 35 p refs
(RR0000110)
(AD-A020151; NPS-53CS76014) Avail: NTIS CSCL 04/2

In recent months there has been considerable interest in applying finite element methods to time-dependent problems in meteorology and oceanography. This paper analyzes a number of recent papers dealing with wave propagation in nonlinear equations with the purpose of delineating some of the more obvious mathematical problems which must be addressed regarding the use of finite elements in numerical forecasting. Some new results are presented. Author (GRA)

N76-27802# Kaysam Corp. of America, Paterson, N.J.
PRODUCTION ENGINEERING MEASURE FOR MANUFACTURE OF METEOROLOGICAL BALLOONS TYPE ML-566 (XE3)/AM Final Report, 1 May 1974 - 14 Nov. 1975
John Kantor Dec. 1975 217 p refs
(Contract DAAB07-74-C-0329)
(AD-A020595) Avail: NTIS CSCL 04/2

The first section contains a complete description of the ML-566(XE3)/AM balloon, and work conducted relating to problems in its construction. All steps of the manufacturing process were evaluated. The work led to the establishing of a pilot production line capable of producing fifteen ML-566(XE3)/AM balloons in an eight hour shift. The second section contains a complete process specification for the manufacture of the ML-566(XE3)/AM balloon. The third section consists of the quality control manual. GRA

N76-27803# GEOMET, Inc., Gaithersburg, Md.
A STUDY ON THE EVOLUTION, PREDICTION, AND MODIFICATION OF LARGE STORMS Final Report
Demetrios J. Moschandreas and Irving Leichter 15 Dec. 1975 321 p refs
(Contract N00014-75-C-1073; NR Proj. 211-199)
(AD-A020498; GEOMET-EF-508) Avail: NTIS CSCL 04/2

The report is an in-depth study of the evolution, prediction, and modification of large storms. The term 'large storm' is used generically and it encompasses hurricanes, tropical depressions and disturbances, extratropical cyclones and frontal activity. The comprehensive research on descriptive meteorology investigates synoptic-scale circulation and presents the fundamental theoretical concepts used in the analysis of large storms. Present forecasting capabilities are reviewed, a number of weather prediction techniques are examined, and the recent use of remote instrumentation is investigated. Finally the research efforts to modify large storms are assessed. GRA

N76-27804# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12806 LANCE, MISSILE NO. 2610, ROUND NO. 266 APT. 30 MAY 1975
May 1975 38 p
(DA Proj. 1T6-65702-D-127)
(AD-A020492; DR-890) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12806 Lance, Missile Number 2610, Round Number 266 APT, are presented in tabular form. GRA

N76-27805# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 3258, ROUND NO. 265 AST 30 MAY 1975 Meteorological Data Report
May 1975 39 p
(DA Proj. 1T6-65702-D-127)
(AD-A020490; DR-889) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 3258, Round Number 265 AST, are presented in tabular form. GRA

N76-27806# SACLANT ASW Research Center, La Spezia (Italy).
THE SACLANTCEN SHIPBORNE COMPUTER ENVIRONMENTAL-DATA ACQUISITION SYSTEM. VOLUME 3: THE METEOROLOGICAL DATA SUBSYSTEM
Francesco Spina, Claude Gehin, and Mario Menelli 15 Jan. 1976 51 p
(AD-A020849; SACLANTCEN-SM-78-Vol-3) Avail: NTIS CSCL 04/2

An automatic environmental data-logging and computing system installed on board SACLANTCEN's research vessel is described in a series of memoranda. This memorandum describes how measurements of wet and dry air temperature, sea-surface temperature, solar radiation and relative wind speed and direction are obtained and applied to the system. The output comprises magnetic tape records of raw data, paper tape records of converted (humidity and absolute wind speed and direction) and averaged data, and plots of averaged data. Author (GRA)

N76-27807# Stanford Research Inst., Menlo Park, Calif.
CORRELATION OF CLOUD BRIGHTNESS AND RADIANCE WITH PRECIPITATION INTENSITY, TASK B Final Report, Jul. 1974 - Sep. 1975
Roy H. Blackmer, Jr. Oct. 1975 133 p refs
(Contract N66314-74-C-2350; SRI Proj. 3529)
(AD-A021173; EPRF-TR-8-75-SRI) Avail: NTIS CSCL 04/2

The objective of this study was to determine the extent to which a combination of satellite measurements of visual cloud brightness and infrared radiance indicates the presence and intensity of precipitation within a cloud. The study was made using digitized data on cloud brightness and radiance from one of the Defense Meteorological Satellite Program satellites and digitized radar data from ground-based weather radars. Two comparisons of clouds and radar data were made. The first related cloud brightness and radiance over a large area to the combined average precipitation rate of all the radar echoes within the area. The second related cloud brightness, radiance, and precipitation statistics for a number of selected small areas of clouds and echoes on a given date. The comparisons showed that, while precipitation intensity appeared to increase with increasing brightness and radiance on a given day, no specific brightness and radiance threshold for distinguishing between precipitation-no precipitation could be selected that would be applicable to days with differing types of cloud cover. Thus, to use brightness and radiance as indicators of precipitation intensity, it is necessary to determine the average brightness and radiance for the type of cloud cover on a large area and then infer precipitation within smaller areas on the basis of the departures of brightness and radiance of the small areas from those of the large areas. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N76-27808*# Ocean Data Systems, Inc., Monterey, Calif.
SURFACE PROPERTIES OF OCEAN FRONTS Final Report
Paul M. Wolff and William E. Hubert 5 Apr. 1976 138 p refs
(Contract NAS5-22370)
(NASA-CR-144776) Avail: NTIS HC $6.00 CSCL 08J

Background information on oceanic fronts is presented and the results of several models which were developed to study the dynamics of oceanic fronts and their effects on various surface properties are described. The details of the four numerical models used in these studies are given in separate appendices which contain all of the physical equations, program documentation and running instructions for the models. Author

N76-27809# Royal Netherlands Meteorological Inst., De Bilt.
TWO PRACTICAL METHODS FOR FORECASTING WAVE COMPONENTS WITH PERIODS BETWEEN 10 AND 25 SECONDS NEAR HOOK OF HOLLAND [TWEE PRAKTISCHE METHODEN VOOR HET MAKEN VAN VERWACHTINGEN VOOR GOLFCOMPONENTEN MET PERIODEN TUSSEN 10 EN 25 SECONDEN NABIJ HOEK VAN HOLLAND]
P. Kruseman 1976 50 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-1) Avail: NTIS HC $4.00

Two methods for forecasting wave components with periods between 10 and 25 secs are described. Such forecasts are intended to give information for very large crude carriers when navigating through the dredged channels to Europoort. A simple spectral model for windwaves, used in developing these

methods is also described. One method produces forecasts for the expected time when the variance of the low-frequency wave components will rise above and drop below a limit of 150 sq cm. Results show that an accuracy of 3 hours can be achieved. The other method forecasts the value of the variance of the low-frequency wave components every 3 hours. A first test shows that the observations may differ by a factor 3 from the forecast values. Despite this large margin, this method gives more useful results. Author (ESA)

N76-27810# Delft Hydraulics Lab. (Netherlands).
DATA REQUIREMENT FOR ONE-DIMENSIONAL MATHEMATICAL MODELLING OF SALINITY INTRUSION IN ESTUARIES
G. Abraham, M. Karelse, and W. B. P. M. Lases (Water Control and Public Works Dept.) Nov. 1975 10 p refs Presented at the 16th IAHR Congr., Sao Paulo, Brazil, Jul. 1975
(Publ-149) Avail: NTIS HC $3.50

One-dimensional real-time modelling of salinity intrusion in estuaries requires the magnitude of the longitudinal dispersion coefficient to be specified beforehand using experimental data. By analyzing the dispersion mechanism, amongst others, it was found that the dispersion coefficient expresses longitudinally integrated effects and varies with location and time, and information on dispersion obtained in one estuary may not be applied directly to another estuary under all circumstances. Experimental data illustrating this are presented. Author (ESA)

N76-27811# National Oceanographic Instrumentation Center, Washington, D.C.
PROCEEDINGS OF NATIONAL OCEANOGRAPHIC INSTRUMENTATION CENTER WORKSHOP
1974 209 p refs Conf. held in Washington, D. C., 6-8 May 1974
(PB-250065/0; NOAA-76012707) Avail: NTIS HC$7.75 CSCL 08J

The report includes presentations on the applications and requirements for turbidity data, instrumentation, problems with existing instrumentation, and new designs and approaches to turbidity measurement in sea water. Some of the recommendations included in this report are: (1) the term (turbidity) shall be used only as a nontechnical appearance descriptor, (2) the measurements shall be labeled to accepted scientifically identifiable terminology, (3) the instruments shall be named in accordance with the physical parameters measured, (4) the requirements for light scattering standards in terms of size and shape distributions, refractive index, concentration, stability and reproducibility should be carefully examined in view of their potential use in widely varying contexts. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N76-27812*# Boeing Co., Houston, Tex.
LIFE SCIENCES PAYLOADS ANALYSES AND TECHNICAL PROGRAM PLANNING STUDIES Final Report, 1 Jul. 1973 - 30 Apr. 1976
Apr. 1976 55 p refs
(Contract NAS9-13655)
(NASA-CR-147799) Avail: NTIS HC $4.50 CSCL 22A

Contractural requirements, project planning, equipment specifications, and technical data for space shuttle biological experiment payloads are presented. Topics discussed are: (1) urine collection and processing on the space shuttle, (2) space processing of biochemical and biomedical materials, (3) mission simulations, and (4) biomedical equipment. J.R.T.

N76-27813*# Scientific Translation Service, Santa Barbara, Calif.
PRELIMINARY RESULTS OF STUDIES ON THE BIOSATELLITE KOSMOS-782
O. G. Gazenko, R. G. Butenko, B. A. Rubin, and L. V. Belousov Washington NASA Jun. 1976 151 p refs Tranl. into ENGLISH of "Predvaritelnyye Rezultaty Issledovaniy na Biosputnike Kosmos-782" Moscow Inst. of Med. Biol. Probl. of USSR Min. of Public Health, USSR Acad. of Sci. 1976 p 1-125
(Contract NASw-2791)
(NASA-TT-F-15500) Avail: NTIS HC $6.75 CSCL 06A

A description is given of the results of experiments on Kosmos-782. The results of all four biological experiments conducted in the joint Soviet-American program are discussed. Positive results were obtained in all of the tests. Author

N76-27814*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Statistics.
STATISTICAL SUPPORT FOR THE ATL PROGRAM Final Report, 1 Jul. 1974 - 15 Jun. 1976
K. Hinkelmann and R. H. Myers 15 Jun. 1976 21 p
(Grant NsG-1071)
(NASA-CR-148311) Avail: NTIS HC $3.50 CSCL 06M

Statistical experimental designs are presented for various numbers of organisms and agar solutions pertinent to the experiment, "colony growth in zero gravity". Missions lasting 7 and 30 days are considered. For the designs listed, the statistical analysis of the observations obtained on the space shuttle are outlined. Author

N76-27815*# California Inst. of Tech., Pasadena. Div. of Biology.
GEOCHEMISTRY OF BIOMOLECULES Final Report, 1 Jul. 1973 - 30 Jun. 1975
James Bonner 12 Jul. 1976 15 p refs
(Grant NGR-05-002-310)
(NASA-CR-148327) Avail: NTIS HC $3.50 CSCL 06M

A highly sensitive fluorometric technique is developed for the determination of biological and geo-organic compounds in ancient sediments and extraterrestrial samples. This technique is used to establish chemical evidence for fossil pigments in an extraterrestrial sample. Also developed is a highly sensitive and specific fluorometric method for the determination of total primary amine nitrogen in soil samples. Author

N76-27816*# Alcorn State Univ., Lorman, Miss. Dept. of Biological Sciences.
BIODEGRADATION OF ROCKET PROPELLANT WASTE, AMMONIUM PERCHLORATE Final Report
Syed M. Z. Naqvi and Abdul Latif 3 Jul. 1975 40 p
(Grant NsG-8005)
(NASA-CR-148323) Avail: NTIS HC $4.00 CSCL 06C

The short term effects of ammonium perchlorate on selected organisms were studied. A long term experiment was also designed to assess the changes incurred by ammonium perchlorate on the nitrogen and chloride contents of soil within a period of 3 years. In addition, an attempt was made to produce methane gas from anaerobic fermentation of the aquatic weed, Alternanthera philoxeroides. Author

N76-27817# Electrotechnical Lab., Tokyo (Japan).
THE MECHANISM OF ANIMAL COLOR VISION
Mitsuo Tonoike, Masamine Takebayashi, and Yutaka Kurioka Jan. 1976 100 p refs In JAPANESE; ENGLISH summary
(Rept-186) Avail: NTIS HC $5.00

A survey of animal color vision from two viewpoints, electrophysiological and behavioral is described. Color vision mechanisms of both invertebrates and vertebrates are introduced, and results on specific animals are summarized. Similarities of the Macaque monkey to human beings in color vision, and physiological results in the visual pathway from the retina to the visual cortex are described. These results give useful information on the visual pathway in the study of human color vision. B.B.

N76-27818# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
ONTOGENETIC DEVELOPMENT OF ARTEMIA SALINA IN LOW AND HIGH PRESSURES Ph.D. Thesis - Bonn Univ.
Renate Peters 15 Mar. 1976 44 p refs In GERMAN; ENGLISH summary Report will also be announced as translation
(DLR-FB-76-19) Avail: NTIS HC $4.00; DFVLR, Cologne DM 18,70

The influence of different atmospheric pressures on the development of the eggs of Artemia salina was investigated. In a total of 65 experiments the animals were bred up to the

stage of the first nauplius in low and high pressures as well as under normal atmospheric conditions. It was found that the space of time needed for full development was constant throughout, whereas the time of incubation, i.e. the interval between the beginning of each experiment and the moment of microscopically perceptible hatching was reduced. Factors which affected the results of the experiments are accounted for. Author (ESA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N76-27819# Advisory Group for Aerospace Research and Development, Paris (France).
THE ROLE OF THE CLINICAL LABORATORY IN AEROSPACE MEDICINE
Raymond G. Troxler, ed. (School of Aerospace Med.) May 1976 127 p refs Presented at the Aerospace Med. Panel Specialists Meeting, Ankara, Turkey, 23 Oct. 1975
(AGARD-CP-180; ISBN-92-835-0165-9) Copyright. Avail: NTIS HC $6.00

Papers are presented which consider laboratory screening of aircraft pilots and crews. Specific topics discussed include: early detection of disease; assessment of stress in air traffic controllers and pilots; and selection of pilots based on results of physical examinations. For individual titles, see N76-27820 through N76-27836.

N76-27820 New York State Univ., Syracuse. Dept. of Pathology.
THE LABORATORY ROLE IN EARLY DETECTION OF DISEASE
John Bernard Henry *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 5 p refs (For availability see N76-27819 18-52)
Copyright.

Utilization of laboratory measurements and examinations in the early detection of disease is discussed. The complex interrelations of sensitivity, specificity, and incidence and the predictive value of positive results are emphasized. J.M.S.

N76-27821 Viale Univ., Rome (Italy).
LABORATORY EMPLOYMENT IN AEROSPACE MEDICINE
G. Paolucci *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 2 p refs (For availability see N76-27819 18-52)
Copyright.

Laboratory applications in aerospace medicine are summarized. These include: (1) determination of the emo-biochemical state in normal or pathological conditions; (2) detection of emotional changes in flight; (3) evaluation of tissue damage in traumatized persons; and (4) applications to aviation casualties. Urinary catechelamine determination and measurement of activity of some serum enzymes are among the techniques discussed.
J.M.S.

N76-27822 School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
COMMON PROBLEMS ENCOUNTERED IN LABORATORY SCREENING OF USAF FLIGHT CREWS FOR LATENT CORONARY ARTERY DISEASE
R. G. Troxler *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 11 p refs (For availability see N76-27819 18-52)
Copyright.

Laboratory screening to identify men at increased risk for coronary artery disease is discussed. Annual determination of cholesterol and triglyceride levels, monitoring of accuracy and precision by in-house and external quality control, and effects of biological variability are among the factors included. Data are presented showing that separation of diseased from nondiseased population improves with increased laboratory precision. A normal range based on percentiles for 925 USAF male flyers without detectable coronary artery disease is also presented. The limitations of this method of normal ranges are discussed.
Author

N76-27823 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
EPIDEMIOLOGICAL STUDIES OF SUBCLINICAL DIABETES MELLITUS
K. Reichenbach-Klinke *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 4 p refs (For availability see N76-27819 18-52)

The incidence of asymptomatic, subclinical, or chemical diabetes in pilots and pilot applicants is studied. A coincidence of other biochemical data: of liver and risk factors of coronary disease with regard to hypertension, obesity, and ECG is also examined. Methods used and results are briefly discussed.J.M.S.

N76-27824 Marburg Univ. (West Germany).
RADIOIMMUNOASSAYS: NEW LABORATORY METHODS IN CLINIC AND RESEARCH
E. H. Craul and H. Mueller *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 9 p refs (For availability see N76-27819 18-52)
Copyright.

Radioimmunoassays (RIA's) which permit quantitative determination for serum components, especially hormones and immunoglobulins, such as IgE, in very slight concentrations as well as pharmaceuticals, such as digitalis are considered. The RIA's are based on the antigen-antibody reaction, in which the substance to be measured and the corresponding radioactively labelled substance compete for binding sites on the specific antibody. Interpretation of the measurement results and further development are discussed. Author

N76-27825 School of Aerospace Medicine, Brooks AFB, Tex. Epidemiology Div.
THE ROLE AND LIMITATIONS OF RADIOIMMUNOASSAY AS A LABORATORY DIAGNOSTIC PROCEDURE
Robert L. Buchenauer *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 5 p refs (For availability see N76-27819 18-52)
Copyright.

The basic concepts of radioimmunoassay (RIA) and competitive protein binding (CPB) are reviewed. The characteristic features of sensitivity and specificity are discussed as they relate to the problems and limitations of test variability and biological interference in the performance of radioassays in the clinical laboratory. Potential problems due to improper patient preparation and specimen collection and handling are mentioned. A survey is presented of selected biological compounds that can currently be measured by radioimmunoassay and related techniques.
Author

N76-27826 Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
APPLICATION OF FLIGHT STRESS SIMULATION TECHNIQUES FOR THE MEDICAL EVALUATION OF AIRCREW PERSONNEL [POSSIBILITE DE L'UTILISATION DES MOYENS DE SIMULATION DES AGRESSIONS AERONAUTIQUES POUR L'EXPERTISE MEDICALE DU PERSONNEL NAVIGANT]
J. Demange, R. Auffret, B. Vettes, and J. L. Poirier *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 7 p refs In FRENCH (For availability see N76-27819 18-52)

The role that may be played by an aerospace medicine laboratory, well equipped with simulation tools such as centrifuges, vibration generators, etc. and measuring tests such as physiologic and psychophysiologic examinations, in the more difficult medical evaluation of aircrew personnel, was described. This is based on the logic that, in borderline cases, a final decision on the medical fitness of pilots for flight status should only be reached after completion of tests that simulate, as realistically as possible, the stresses actually encountered in flight. In addition, such a laboratory is able, by repeating such tests, to objectively obtain longitudinal data on a pilot, to study transient favorable or unfavorable changes, and to observe the long-term effects of aging. Transl. by Y.J.A.

N76-27827 Army Aeromedical Research Lab., Fort Rucker, Ala.
AVIATOR PERFORMANCE: BIOMEDICAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL ASSESSMENT OF PILOTS DURING EXTENDED HELICOPTER FLIGHT
Kent A. Kimball and David B. Anderson *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 15 p refs (For availability see N76-27819 18-52)
Copyright.

The physiological, psychological, and performance effects of extended helicopter flight are investigated. Measurements of biochemical, physiological, and psychological parameters were obtained and compared with inflight performance measures obtained by the USAARL Helicopter Inflight Monitoring System. Six rotary wing aviators performed extended daily flight missions for a period of five days. In addition, when not flying, various psychological tests were administered. Physiological and biochemical monitoring were conducted throughout the five day period. The aviators were on a controlled diet and slept approximately three hours each night. Preliminary findings are presented in relation to performance, biochemical, physiological, and psychological parameters. Author

N76-27828 Civil Aeromedical Inst., Oklahoma City, Okla. Aviation Physiology Lab.
STUDIES ON STRESS IN AVIATION PERSONNEL, ANALYSIS AND PRESENTATION OF DATA DERIVED FROM A BATTERY OF MEASUREMENTS
C. E. Melton, J. M. McKenzie, J. T. Saldiver, and Marlene Hoffmann *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 6 p refs (For availability see N76-27819 18-52)
Copyright.

Determination of stress in aircraft pilots and air traffic controllers is considered. The complexity of the data derived from batteries of measurements of stress is discussed. A method is described in which data related to stress indicators are weighted so that their importance is equivalent. The weighted value are integrated to yield an index, C sub s, which allows a comparative overview of stress in air traffic control facilities. Data so normalized can be presented in graphic form without oversimplification. The method increases the usefulness of stress studies to managers. Author

N76-27829 Army Research Inst. of Environmental Medicine, Natick, Mass.
THE FIELD ARTILLERY FIRE DIRECTION CENTER AS A LABORATORY AND FIELD STRESS-PERFORMANCE. MODEL 1: POSITION PAPER. 2: PROGRESS TOWARDS AN EXPERIMENTAL MODEL
J. W. Stokes, L. E. Banderet, R. P. Francesconi, A. Cymerman, and J. B. Sampson *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 10 p refs (For availability see N76-27819 18-52)
Copyright.

The 5-man fire direction center (FDC), common to all Field Artillery batteries, was chosen for study in the laboratory and field to evaluate the impact of environmental and situational stress on the complex performance of highly trained and motivated individuals working together as a team. The working environment of a field FDC was simulated within a hypobaric chamber and a volunteer FDC team from an elite U.S. Army unit was tested using realistic matched combat scenarios. To minimize practice effects, the team was initially given 26 hours of intensified training (ITS). The team was then tested blinded as to the altitude condition for 48 hours at both a control altitude and high altitude; the team rested 22 hours between ITS and control and 48 hours between control and the high altitude conditions. Mission performance during ITS and control was sensitive to disrupted sleep-rest cycles, with errors clustering at times of low arousal. At high altitude, performance was less efficient during the first 10 hours; most serious errors involved processing of digits. Over learned FDC skills showed little deterioration even when the men were ill with acute moutain sickness. Compensatory behaviors were evident and technical performance for the last 38 hours at high altitude equalled or exceeded control. Thus communications, psychomotor, and judgement aspects of FDC performance, as well as measures of symptoms, mood, and neuroendocrine response, appear differentially sensitive to psychological stress, hypoxia, and fatigue. Author

N76-27830 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
EXPERIENCE WITH ELECTROENCEPHALOGRAPHY IN APPLICANTS FOR FLYING TRAINING 1971 AND 1972
H. Oberhole *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 6 p refs (For availability see N76-27819 18-52)
Copyright.

Standard criteria for defining abnormal tracings in electroencephalography are summarized. These criteria are evaluated in relation to flying fitness examinations. J.M.S.

N76-27831 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
BEHAVIOR OF SOME RESPIRATORY PARAMETERS IN CANDIDATE PILOTS. A COMPARATIVE STUDY BETWEEN TWO DIFFERENT GROUPS EXAMINED AT TEN YEARS INTERVAL
C. A. Ramacci and G. Meineri *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 7 p refs (For availability see N76-27819 18-52)
Copyright.

The hypothesis that static respiratory values could undergo a change in the course of time, in the same age groups was studied. A comparison was carried out between two groups of candidate military pilots. The respiratory parameters taken into consideration were: vital capacity and time vital capacity. The results show that no significant change took place. It is still deemed advisable to perform periodic checks. The existence of other elements that could exert a certain influence on the parameters studied was established. Author

N76-27832 Italian Air Force Medical Service H. Q., Rome.
SURVEY ON MEDICAL REQUIREMENTS AND EXAMINATION PROCEDURES FOR THE PREVENTION OF TRAUMATIC AND NON-TRAUMATIC OSTEOARTHROPATHIES DUE TO FLYING ACTIVITIES
Gaetano Rotondo *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 6 p refs (For availability see N76-27819 18-52)
Copyright.

The criteria, the medical requirements, and the examination procedures employed during the selection of pilots are examined in terms of the osteoarticular system and the spine. The conditions facilitating the occurance of osteo-arthropathies during high speed flight are emphasized. Author

N76-27833 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
CONTROL OF HEMOSTATIC DISORDERS IN AIR FORCE PERSONNEL
G. Blundo and G. Paolucci *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 2 p refs (For availability see N76-27819 18-52)
Copyright.

A general examination was carried out to establish the risk from possible hemostatic disorders, due to diseases, drugs or toxic industrial products, of subjects occupationally exposed to traumatisms. The hemostatic process was examined by studying partial thromboplastin time, prothrombin time, thromboelastographic record, platelet count, and individual anamnesis. The data obtained are discussed with respect to frequencies of hemostatic disorders found, and the utility of laboratory control in medical examination. Author

N76-27834 Service de Sante pour l'Armee de l'Air, Paris (France).
INVESTIGATIONS OF THE BLOOD VESSELS ELASTIC EXPANSION, HEART OUTPUT, AND HEART RHYTHM, BASED ON THE MEASUREMENT OF VARIATIONS IN THE THORACIC ELECTRIC IMPEDANCE [EVALUATION DE LA DISTENSIBILITE VASCULAIRE DU DEBIT CARDIAQUE, ET DE LA CHRONOLOGIE CARDIAQUE, PAR LA MEASURE DES VARIATIONS D'IMPEDANCE ELECTRIQUE THORACIQUE]
J. Colin, J. Demange, and J. Langlois *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 12 p refs In FRENCH (For availability see N76-27819 18-52)
Copyright.

Changes in the electric impedance measured with electrodes on the anterior portion of the thorax, near the descending aorta, were found to be proportional to the volumetric changes of the thoracic vessels in that region. Investigations of the effect of age on the data obtained with 91 healthy subjects disclosed that the change in the electric impedance are partly caused by changes in the elasticity of the blood vessels. The experimental data was also used to study the systolic volume and heart output. Calibration was obtained using 120 simultaneous measurements with the dilution method and electric impedance data on cardiac subjects. The results obtained with healthy subjects are in good agreement with those previously obtained using Fick's method, especially in regards to the effects of age and position. On the other hand, the mediocre correlation between the dilution and electric impedance methods with cardiac subjects makes this approach presently impractical clinically. Transl. by Y.J.A.

N76-27835 Amsterdam Univ. (Netherlands).
THE INFLUENCE OF ALCOHOL ON SOME VESTIBULAR TESTS
A. J. Greven, W. J. Oosterveld, and Wilhelmina Gasthuis *In* AGARD The Role of the Clin. Lab. in Aerospace Med. May 1976 6 p (For availability see N76-27819 18-52)
Copyright.

In human subjects the influence of an alcoholic beverage on some vestibular tests was examined; 48 experiments were conducted in 27 normal humans, 15 men and 12 women. The effect of alcohol was observed upon fixation nystagmus, gaze nystagmus, the visual tracking pendulum test, and the optokinetic induced nystagmus. Alcohol was given in four different quantities: 0.1, 0.2, 0.4 and 0.8 g/kg body weight, as whiskey (34%). With each dosage 12 experiments were performed in 12 subjects (6 men and 6 women). Author

N76-27836 Advisory Group for Aerospace Research and Development, Paris (France).
THE CONTRIBUTION OF SKIN BIOPSY TO THE DETECTION OF VASCULAR SENESCENCE, RELATIONSHIP WITH CAROTIGRAM
C. F. Nogues, R. Carre, F. Lizeray, and E. Cava *In its* The Role of the Clin. Lab. in Aerospace Med. May 1975 9 p refs In FRENCH (For availability see N76-27819 18-52)
Copyright.

The significance of the I/A ratio in the carotidogram was demonstrated, where I is the amplitude of the catacrotic incisure and A is the total amplitude of the curve. Studies performed with hydraulic models have shown that this ratio increases with the peripheral resistance and a decrease in the elasticity. This ratio was compared to changes in the skin microscopic structure observed following biopsies performed in the region of the posterior iliac spine, using data obtained from 93 aircrew members; a very close correlation was observed between the skin structure and the I/A ratio. It follows from this that the carotidogram may be used in studies of the arterial pulse and gives an indication of the biologic age. Transl. by Y.J.A.

N76-27837*# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
ELECTROPHORESIS EXPERIMENT FOR SPACE Final Report
John W. Vanderhoff and F. J. Micale Apr. 1976 87 p
(Contract NAS8-28654)
(NASA-CR-149925) Avail: NTIS HC $5.00 CSCL 06A

The Apollo 16 electrophoresis experiment was analyzed, demonstrating that the separation of the two different-size monodisperse latexes did indeed take place, but that the separation was obscured by the pronounced electroosmotic flow of the liquid medium. The results of this experiment, however, were dramatic since it is impossible to carry out a similar separation on earth. It can be stated unequivocally from this experiment that any electrophoretic separation will be enhanced under microgravity conditions. The only question is the degree of this enhancement, which can be expected to vary from one experimental technique to another. The low-electroosmotic-mobility coating (Z6040-MC) developed under this program was found to be suitable for a free-fluid electrophoretic separation such as the experiment designed for the ASTP flight. The problem with this coating, however, is that its permanency is limited because of the slow desorption of the methylcellulose from the coated surface. Author

N76-27838*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY RESULTS OF AN EXPERIMENT ON HUMAN CHRONOBIOLOGY AND NEUROBIOLOGY IN A SUBTERRANEAN ENVIRONMENT. 1: LIFE ON A BICIRCADIAN RHYTHM (P. ENGLENDER). 2: LIFE IN CONTINUOUS LIGHT (J. CHABERT). LONGITUDINAL ANALYSIS AND COMPUTER CORRELATION OF NEUROLOGIC, PSYCHOLOGICAL AND PHYSIOLOCIG DATA COLLECTED IN BEYOND-TIME CAVE EXPERIMENTS FROM 1968-1969
M. Siffre Washington NASA Jun. 1976 330 p refs Transl. into ENGLISH of "Convention de Recherche de la Delegation Generale a la Recherche Scientifique et Technique", DGRST-70/02/183 France p 1-346
(Contract NASw-2790)
(NASA-TT-F-15499; DGRST-70/02/183) Avail: NTIS HC $10.00 CSCL 06S

Two simultaneous experiments are described that give confirmation of the fact that human beings will spontaneously adopt a 48-hour sleep-wakefulness rhythm when placad under beyond-time conditions in a subterranean environment such as a cave. The time required for the onset of this rhythm varies with the individual, however; one subject achieved it in 15 days, while another did so only after three months. It was found that sleep requirements do not increase in proportion to the period of the cycle: on an average of 1/3 more sleep, it was possible to achieve more than twice the activity duration. Alertness was measured through various tests, including reaction time, grip strength, and dexterity, and these findings were correlated with various physiologic parameters -- most importantly, polygraphic recordings of sleep. Results indicate that there is no decrease in alertness on a 48-hour rhythm. Author

N76-27839*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A LOGIC-CONTROLLED OCCLUSIVE CUFF SYSTEM Patent Application
Joseph T. Baker (Technol. Inc., Houston, Tex.), William W. Hursta (Technol. Inc., Houston, Tex.), and George W. Hoffler, inventors (to NASA) Filed 1 Jun. 1976 14 p
(Contract NAS9-13291)
(NASA-Case-MSC-14836-1; US-Patent-Appl-SN-691647) Avail: NTIS HC $3.50 CSCL 06B

The occlusive cuff system of this invention comprises a pressure cuff and a source of regulated compressed gas feeding the cuff through an electrically operated fill valve. An electrically operated vent valve vents the cuff to the ambient pressure. The fill valve is normally closed and the vent valve is normally open. In response to an external start signal, a logic network opens the fill valve and closes the vent valve, thereby starting the pressurization cycle. A pressure transducer continuously monitors the pressure in the cuff. When the transducer's output equals a selected reference voltage, a comparator causes the logic network to close the fill valve and start a timer. The timer, after a selected time delay, opens the vent valve to the ambient pressure, thereby ending the pressurization cycle. NASA

N76-27840# Oak Ridge National Lab., Tenn.
HEALTH PHYSICS DIVISION Annual Progress Report, period ending 30 Jun. 1975
P. T. Perdue and D. J. Christian 30 Jun. 1975 323 p refs
(Contract W-7405-eng-26)
(ORNL-5046) Avail: NTIS

A liquid organic scintillator, combined with solvent extraction techniques, can provide a sensitive means to measure small amounts of alpha-emitting heavy metals. Progress is reported on a recent effort to optimize both the detection system and the solvent extraction process for liquid organic scintillators. Radiation levels in human bone and tissue samples were monitored, and the applications of dosimetry to nuclear weapons fallout, nuclear reactor safety, and industrial safety are examined. NSA

N76-27841# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPACE SLED FACILITY, PHASE A Final Report

Apr. 1976 135 p
(Contract ESA-SC/89-HQ)
(ESA-CR(P)-802) Avail: NTIS HC $6.00

A multipurpose facility called space sled is proposed for vestibular research on human and animal test subjects in Spacelab, with the following characteristics: specially formed seat/platform for test subjects fixation suspended in a vertically mounted gimbal structure for test subjects positioning, guided by two rails mounted in front of each Spacelab rackside for safety reasons, and driven by electromotor via capstan drive. This facility provides various rectilinear and oscillating acceleration profiles for mechanical stimulation of the test subject. Provisions for mounting an optokinetic and caloric stimulation device are foreseen. With the proposed design, disturbing uncontrolled accelerations can be prevented to a level of 0.001 g (0.01 g for constant g oscillation) theoretically as the analysis of the dynamic behavior of the structure and acceleration control system show. Author (ESA)

N76-27842# European Space Agency, Paris (France).
SPACELAB AND ITS UTILIZATION FOR BIOMEDICAL EXPERIMENTS
G. Seibert 1975 23 p Presented at the 18th COSPAR Meeting, Varna, Bulg., 29 May - 7 Jun. 1975
Avail: NTIS HC $3.50

Opportunities of using Spacelab for biomedical investigations are reviewed. Essential knowledge required is concerned with the performance of the vestibular balancing mechanism and the related problem of stomach awareness. Safety of the crew and their genetic cells in relation to cosmic radiation is considered vital. The effect of zero gravity on the cardiovascular system will be studied. Animals and plants will be included in the experiments. ESA

N76-27843# Minnesota Univ., Minneapolis. Lab. of Neurophysiology.
DYNAMIC CHARACTERISTICS OF HUMAN MOTOR PERFORMANCE IN CONTROL SYSTEMS Final Scientific Report
C. A. Terzuolo Aug. 1975 9 p refs
(Grant AF-AFOSR-1969-71; AF Proj. 9777)
(AD-A020662; AFOSR-76-0054TR) Avail: NTIS CSCL 06/16

The following Air Force research projects were reported on: Motor control; Data Processing by Small Neuronal Networks; Reflex Control of Respiration; Membrane Properties Leading to Repetitive Firing; Muscle Spindle Properties; and Decoding and Classification of Visual Patterns by Humans. GRA

N76-27844# Human Resources Research Organization, Alexandria, Va.
A PARTIALLY ANNOTATED BIBLIOGRAPHY ON OPTIMAL WORK-REST CYCLES Consulting Report
John D. Engel and Harold P. Bishop Mar. 1971 51 p refs
(Contract DAHC19-70-C-0012; DA Proj. 2Q0-62107-A-712)
(AD-A020655) Avail: NTIS CSCL 05/10

A bibliography was undertaken to review those studies whose results would assist in the eventual selection of optimal work-rest cycles for specified types of performance. It became apparent during the literature search that only a few laboratory experiments clearly dealt with the work-rest cycling question. Hence, it was necessary to examine the results of a number of other studies which were less directly concerned with the question but were pertinent. In general, the studies were those in which observations of performance extended for a period of 24 hours or longer since it was felt that such a period of observation was the minimum necessary for valid applicability to the scheduling of work and rest over prolonged intervals. Author

N76-27845# Science Applications, Inc., El Segundo, Calif.
EFFECTS OF SULFUR OXIDES ON THE LUNG: AN ANALYTIC BASE. PART 2: APPENDIX
D. F. Hausknecht and R. A. Ziskind Sep. 1975 148 p refs Sponsored by Elec. Power Res. Inst.
(PB-249685/9; SAI-75-566-LA-Pt-2; EPRI-205A) Avail: NTIS HC $6.00 CSCL 06T

Proceedings are presented from a workshop panel comprised of experts in sulfur oxide toxicology, pulmonary medicine, mathematical modeling of the respiratory system, including detailed morphometry, and cytology. Each of the reviewers was provided a copy of the report in draft several weeks before the workshop which was conducted November 25 and 26, 1974 at EPRI Headquarters in Palo Alto. The reviewers were requested to comment on the validity and adequacy of the approach described in achieving the goals stated in the report. The written reviews provided by the workshop participants are reproduced in this report. GRA

N76-27846# Advisory Group for Aerospace Research and Development, Paris (France).
FOURTH ADVANCED OPERATIONAL AVIATION MEDICINE COURSE
A. N. Nicholson May 1976 105 p refs Course held at Farnborough, England, 17-26 Jun. 1975
(AGARD-R-642) Copyright. Avail: NTIS HC $5.50

Various aspects of aviation medicine was studied in detail. Topics included the training of aircrew in aviation medicine, medical aspects of naval helicopter operations on the northern flank, developments in personal equipment with special reference to helmet developments, high speed escape and thermal problems, and the use of hypnotics in air operations. For individual titles, see N76-27847 through N76-27870.

N76-27847 Institute of Naval Medicine, Alverstoke (England).
MEDICAL ASPECTS OF OPERATING ON THE NORTHERN FLANK OF NATO
W. J. Blake *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p refs (For availability see N76-27846 18-52)

Pre-Arctic and survival training to achieve a higher standard of physical fitness required for Arctic service is described. Emphasis is placed on protection and the problems of operating in cold environments. Among the main topics discussed are: (1) environmental effects; (2) use of protective clothing; (3) use of shelter; (4) life style; (5) cold injuries and (6) survival techniques. B.B.

N76-27848 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE OPERATION OF HELICOPTERS FROM SMALL SHIPS c05
J. W. Davies *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p (For availability see N76-27846 18-52)

The operation of the Wasp helicopter from the decks of Tribal class and Leader class frigates of the Royal Navy is described and some of the difficulties involved in such operations, including ship movement and turbulence, are discussed. Author

N76-27849 Royal Naval Air Medical School, Seafield Park (England).
THE IMMERSION VICTIM
F. St. C. Golden *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p refs (For availability see N76-27846 18-52)

The mechanisms involved in the training of rescue crews and the clinical management of the immersion victim are discussed. B.B.

N76-27850 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
MECHANICS OF HEAD PROTECTION
D. H. Glaister *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p refs (For availability see N76-27846 18-52)

Various standards are discussed which cover three main aspects of helmet design, namely; (1) impact protection. The helmet is struck under controlled conditions against a first or hemispherical anvil and the transmitted force is measured; (2) penetration resistance. The helmet is struck against a conical anvil having a 0.5 mm radius tip; and (3) helmet retention. After a moderate preloading period, the strap is loaded progressively. It is further stated that the standards cover requirements for factors such as flammability, extreme cold, heat and humidity, and individual impact testing of padding materials. B.B.

N76-27851 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

AUDITORY COMMUNICATION
R. G. Green *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p (For availability see N76-27846 18-52)

The problem of ambient noise in aircraft is discussed with direct relation to auditory communication and aircraft crew members. Predominant sources and nature of noise in high performance single and two seat aircraft, and propeller driven aircraft are listed. Possible solutions to reduce noise and enhance communication are reported. B.B.

N76-27852 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Applied Vision Section.
EYE PROTECTION AND PROTECTIVE DEVICES **c54**
D. H. Brennan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 8 p ref (For availability see N76-27846 18-52)

Major ocular hazards encountered in military aviation and some protective measures which may be adopted are discussed. The hazards considered are solar glare, bird strike, wind blast, miniature detonating cord, lasers and nuclear flash. Author

N76-27853 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Flight Systems Section.
HELMET MOUNTED SIGHTS AND DISPLAYS **c54**
John Laycock *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p refs (For availability see N76-27846 18-52)

The possible applications of helmet mounted sights and displays are considered. Brief details of the software and hardware problems which may be experienced with such systems are given before outlining in more detail the psychological problems encountered. The manner in which the rate of visual information processing by the pilot may be increased by varying physical parameters is discussed. Author

N76-27854 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
WARNING SYSTEMS IN AIRCRAFT CONSIDERATIONS FOR MILITARY OPERATIONS **c54**
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p refs (For availability see N76-27846 18-52)

The principles employed in the design of warning systems in aircraft are presented. Visual, auditory, and tactile signals are discussed in detail. It is concluded that the concept of visual display combined in a sensory warning system is probably the most efficient method of presenting essential emergency information to the crew. It is further stated that apart from a few specific cases, audio warnings do not have distinct advantages over visual displays. B.B.

N76-27855 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Flight Skills Research Section.
ADVANCES IN MILITARY COCKPIT DISPLAYS **c06**
J. M. Rolfe *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p refs (For availability see N76-27846 18-52)

Recent advances in display technology which have taken place in relation to the military cockpit were examined. Emphasis was placed upon providing adequate assessment of information needed by the aircrew in order to perform their task, and from this evolves a display system capable of presenting information in a flexible manner. It is further stated that the most widely used form of display is the cathode ray tube which has the required flexibility. B.B.

N76-27856 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
MAP DISPLAYS **c04**
R. M. Taylor *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p refs (For availability see N76-27846 18-52)

The major types of map displays are distinguished and their functions are described. The principal design parameters are reviewed with particular reference to user requirements and human factors, and an outline is given of current problems of map annotation, display legibility and brightness, radar-map matching and display complexity. Author

N76-27857 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PHYSIOLOGICAL LIMITATIONS TO HIGH SPEED ESCAPE **c54**
David H. Glaister *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p refs (For availability see N76-27846 18-52)

The forces which must be imposed for satisfactory high-speed ejection approach, or even surpass, the limits of human tolerance at several stages in the ejection sequence are: (1) the +Gz acceleration of the ejection seat; (2) the -Gx acceleration due to wind drag; (3) direct (pressure) and indirect (flail) effects of wind blast; (4) other inertial forces (centrifugal, tangential) due to seat instability; (5) opening shock of drogue parachute and main canopy; and, (6) ground impact. Of these forces the first must be increased to achieve tail fin clearance at high speed, the second and third increase with the square of indicated air speed, the fourth increases with airspeed, and the fifth must be increased if escape is to be successful in the high-speed low-level case. Only the last force is uninfluenced by aircraft speed at ejection and the message is clear - high speed has a major effect on forces imposed during assisted escape from aircraft. These forces are considered in relation to the mechanism of injury, incidence of injury, tolerance to injury and in particular, to the influence of air speed at ejection. Author

N76-27858 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PRINCIPLES AND PROBLEMS OF HIGH SPEED EJECTION **c54**
A. J. Barwood *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p (For availability see N76-27846 18-52)

The principles of ejection are described: to recover aircrew uninjured, which is best achieved by the use of as simple an escape system as technically possible. Once the system has been initiated all sequences automatically follow and there is no further action required by the ejectee until he is descending on a fully deployed parachute. The hazards of ejection and the development of the open ejection seat system up to the maximal capability are briefly described. The sequences of ejection on a typical Martin Baker Aircraft escape system are outlined to stress the simplicity, and therefore technical reliability, of this system as used in the majority or service aircraft in the UK Services. Author

N76-27859 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
CURRENT AND FUTURE ESCAPE SYSTEMS **c54**
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

The role of escape systems in fixed wing military aircraft is now well established. Almost all combat fixed wing aircraft in NATO countries are equipped with ejection seats and considerable effort is spent on improving the performance of these seats for future aircraft. Some of these areas where current escape systems are deficient and some ways in which future systems seek to overcome those deficiencies are described. Author

N76-27860 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
HELICOPTER ESCAPE AND SURVIVABILITY **c54**
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

Military helicopters are not equipped with ejection seats as are fixed wing aircraft. Escape systems are presented to fill the need for helicopter aircrew protection. A.S.K.

N76-27861 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE PHYSIOLOGY OF HIGH G PROTECTION **c54**
B. J. Lisher *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p refs (For availability see N76-27846 18-52)

The introduction of several new combat aircraft which have the structural integrity and the engine power to execute maneuvers

at high levels of acceleration for considerable periods of time reintroduces the concept that certain operations, particularly air to air combat, may be physiologically limited rather than limited by aircraft design parameters. An acceleration level of 8G sustained for 60 seconds has been suggested as a point to which acceleration protection should be aimed, although higher G levels for shorter periods of time can be expected. Two methods of high G protection are presented, one using a reclining seat and the other using immersion of the body in water. Author

N76-27862 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
A COMPARISON OF RECENT ADVANCES IN BRITISH ANTI-G SUIT DESIGN **c54**
J. W. Davies *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p refs (For availability see N76-27846 18-52)

Comparisons in the field of a knee length anti-G suit and an external anti-G suit, with the standard British anti-G suit worn close to the skin, are described and the results discussed. Author

N76-27863 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL PROBLEMS IN MILITARY AIR OPERATIONS **c54**
J. R. Allan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

The thermal problems of an aircrew functioning in air operations over the full range of natural environments are discussed. A.S.K.

N76-27864 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Cold Environment Research Section.
OPERATIONS IN COLD ENVIRONMENTS
P. Marcus *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p (For availability see N76-27846 18-52)

The incidence of cold stress in military aviation is discussed together with methods for overcoming the problems it poses, by cabin conditioning or by the use of insulating or heated garments. Protective clothing is also required by aircrew to aid survival in emergencies and the principles of its design are considered. Lastly, an account is given of the RAF's permanent cold climate detachments and of cold weather operational and survival training. Author

N76-27865 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL PROBLEMS IN HIGH PERFORMANCE AIRCRAFT **c54**
J. R. Allan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p ref (For availability see N76-27846 18-52)

A general review of current thermal problems in high performance aircraft, their origins and current design trends in their solution is given. Author

N76-27866 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PERSONAL THERMAL CONDITIONING **c54**
Craig Saxton *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p (For availability see N76-27846 18-52)

The inadequacy of cabin conditioning systems in high performance aircraft has resulted in aircrew being exposed to severe heat stress situations within the cockpit environment during certain flight profiles. To alleviate the physiological strain imposed upon the man, methods of thermally conditioning the micro-environment within flying clothing assemblies have been investigated and applied to operational situations. The cooling agents used in the personal thermal conditoning role have been air or water. The former has been utilized either as an evaporative agent or convective cooling agent. The relative merits of the different personal conditioning systems are discussed and a case made for the development of a practical liquid-cooled suit system for use in present and future high-performance aircraft. Author

N76-27867 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
CABIN PRESSURISATION AND OXYGEN SYSTEMS-REQUIREMENTS **c54**
J. Ernsting *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p refs (For availability see N76-27846 18-52)

The considerable interactions between the physiological requirements for cabin pressurization and the relationship between concentration of oxygen and cabin altitude required of oxygen delivery systems for aircrew in flight are explored. Although work performed until 1960 suggested that hypoxia induced by breathing air at altitudes of up to 8,000 feet was acceptable, investigations performed more recently at RAF IAM and elsewhere suggest that the maximum acceptable degree of hypoxia for aircrew in flight is that associated with breathing air at 5,000 feet. The incidence of hypoxia due to malfunction of oxygen delivery equipment and of decompression sickness at altitudes above 20,000 feet is such that the maximum cabin altitude in combat aircraft should not exceed 20,000 to 22,000 feet. The concentration of oxygen which must be breathed to avoid transient hypoxia on sudden failure of a pressure cabin even when 100% oxygen is delivered to the respiratory tract immediately the decompression occurs is generally greater in high differential pressure aircraft than that required to prevent significant hypoxia with the pressure cabin intact. Even in modern combat aircraft this consideration requires a higher than 5,000 feet equivalent breathing mixture at aircraft altitudes greater than 35,000 feet. Author

N76-27868 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
SEAT MOUNTED OXYGEN REGULATOR SYSTEMS IN UNITED KINGDOM AIRCRAFT **c54**
A. J. F. MacMillan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

The rationale for mounting a demand oxygen regulator assembly on the ejection seat of combat aircraft is described. The special facilities which have been incorporated in systems used in the Royal Air Force by utilizing the advantages of seat mounting are discussed and it is considered that the system provides true duplication of essential components, allows very simple crew drills and reduces aircraft servicing penalties in the event of malfunction of the regulator package. Author

N76-27869 London Hospital Medical Coll. (England). Pharmacology Section.
ABSORPTION, METABOLISM AND EXCRETION OF HYPNOTIC DRUGS
Stephen H. Curry *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 7 p refs (For availability see N76-27846 18-52)

Absorption, metabolism and excretion are the processes which govern the growth and decay of plasma concentrations of all drugs, including hypnotics. Variations in plasma concentrations lead to corresponding variations in effect, although the exact detail of the relation between level and effect is more complex than is implied by this statement. Existing data on absorption, metabolism and excretion for the various hypnotic drugs are of variable detail. Total absorption of oral doses is generally believed to occur, although when systematically examined, absorption has sometimes been found to be incomplete. Metabolism occurs by a variety of reactions, but only occasionally to pharmacologically-active compounds. Excretion is of both unchanged drug and metabolites in bile and urine. These events and processes as they relate to hypnotic drug actions are considered in detail. Author

N76-27870 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
RESIDUAL EFFECTS OF HYPNOTICS
A. N. Nicholson *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 8 p refs (For availability see N76-27846 18-52)

The residual effects of hypnotic drugs after their therapeutic purpose is fulfilled was considered. Test subject motor skills were examined for residual effects using a method of adaptive tracking. A.S.K.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N76-27871*# Baylor Univ., Houston, Tex. Psychophysiology Lab.

PSYCHOLOGICAL AND PHYSIOLOGICAL CORRELATES OF STRESS: PERFORMANCE ON A COOPERATIVE TASK Final Report

Robert Roessler, Jerry Lester, and Ted Knapp 2 Jun. 1976 50 p refs

(Contract NAS9-13452)

(NASA-CR-147819) Avail: NTIS HC $4.00 CSCL 05E

The relationship of personality dimensions to performance was investigated. The personality measure used to select subjects, the Barratt impulsiveness scale, is hypothesized to be related to a style of behavior which should affect the trend of choices which various subjects will make. Personality dimensions were specifically examined during performance of a cooperative task, the Prisoner's Dilemma. Author

N76-27872# National Academy of Sciences - National Research Council, Washington, D.C.

GUIDELINES FOR DEVELOPING A TRAINING PROGRAM IN NOISE SURVEY TECHNIQUES Final Report

William Gately, Paul L. Michael, and George W. Kamperman Jul. 1975 34 p refs

(Contract N00014-67-A-0244-0021)

(AD-A016677; EPA-550/9-75-021) Avail: NTIS CSCL 05/9

The report contains guidelines for the content, format, organization, and administration of a training program for noise survey technicians. It is intended to provide assistance to state and local governments in setting up a training program for training technicians to assist in the enforcement of noise ordinances and investigation of noise complaints. The program is directed toward trainees with a minimum of a high school education and no previous experience in acoustics. The report outlines and explains material to be covered in a 4 1/2 day training program. Author

N76-27873# San Diego State Foundation, Calif.

SELF-REGULATION AS AN AID TO HUMAN EFFECTIVENESS AND BIOCYBERNETICS TECHNOLOGY AND BEHAVIOR Annual Report, 1 Jul. 1974 - 31 Dec. 1975

Robert L. Benshoff Jan. 1976 45 p refs

(Contracts N00014-70-C-0350; N00014-76-C-0185; ARPA Order 1595; ARPA Order 3065)

(AD-A021105) Avail: NTIS CSCL 05/10

This report includes a summary and overall conclusions from the 5-year research program concerned with self-regulation as an aid to human effectiveness. While the findings clearly demonstrated that self-regulation of most physiological variables were possible, the control of these various physiological measures did not consistently lead to enhanced performance. The report also includes the current subcontracts awarded under the Biocybernetics Technology and Behavior program. The research goals and first year's progress of each subcontractor are also presented. GRA

N76-27874# New Mexico State Univ., University Park. Dept. of Psychology.

DIMENSIONS OF PERFORMANCE ASSESSMENT AND SKILL DEVELOPMENT Final Annual Status Report

Warren H. Teichner 30 Oct. 1975 16 p refs

(Contract F44620-71-C-0072; AF Proj. 9778)

(AD-A021100; AFOSR-76-0052TR) Avail: NTIS CSCL 05/10

The research goal of this contract was the development of techniques which might be applied to complex flight trainers on-line to provide: (1) diagnostic measures of learning difficulties and (2) remedial steps to overcome the difficulties. Three phenomena -- response blocking, filtering and queuing -- appeared to be especially useful as a source of diagnostic measures. In the latter case, the signals become lost or distorted. All three phenomena are well-known as detrimental stress responses in the learning of complex tasks. It appears that response blocking may occur whenever there is a competition either between (1) processes which are required to act upon the same data or between (2) responses to the output of a single process when, in each case, the competitive elements can only operate one at a time. Within the general theoretical framework, the most important competitive processes are: storing in short-term memory vs. retrieval from short-term memory; retrieval from short-term memory vs. translation from one stimulus code to another; and translation from one stimulus code to another vs. translation from a stimulus code to a response code. GRA

N76-27875# Navy Personnel Research and Development Center, San Diego, Calif.

AN EVALUATION OF COMPUTERIZED TESTS AS PREDICTORS OF JOB PERFORMANCE. 2: DIFFERENTIAL VALIDITY FOR GLOBAL AND JOB ELEMENT CRITERIA Final Report 1 Jul. 1972 - 30 Jun. 1973

Charles H. Cory Jan. 1976 59 p refs

(NR Proj. 150-335; RR0420401)

(AD-A020867; NPRDC-TR-76-28) Avail: NTIS CSCL 05/10

The report presents data concerning the validity of a set of experimental computerized and paper-and-pencil tests for measures of on-job performance on global and job elements. It reports on the usefulness of 30 experimental and operational variables for predicting marks on 42 job elements and on a global criterion for electrician's mate, personnelman, sonar technician, and apprenticeship rating groups. GRA

N76-27876# Minnesota Univ., Minneapolis. Dept. of Psychology.

A SIMULATION STUDY OF STRADAPTIVE ABILITY TESTING

C. David Vale and David J. Weiss Dec. 1975 61 p refs

(Contract N00014-76-C-0243; NR Proj. 150-382; RR0420401)

(AD-A020961; RR-75-6) Avail: NTIS CSCL 05/10

A conventional test and 2 forms of a stradaptive (stratified adaptive) test were administered to thousands of simulated subjects by minicomputer. Characteristics of the three tests using several scoring techniques were investigated while varying the discriminating power of the items, the lengths of the tests, and the availability of prior information about the testee's ability level. The tests were evaluated in terms of their correlations with underlying ability, the amount of information they provided about ability, and the equiprecision of measurement they exhibited. The major findings are listed. GRA

N76-27877# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

PROCESSES IN ACQUIRING KNOWLEDGE Semiannual Technical Report, 15 Sep. 1975 - 30 Mar. 1976

Allan Collins Jan. 1976 63 p refs

(Contract N00014-76-C-0083; ARPA Order 2284; NR Proj. 154-379; RR0420401)

(AD-A020270; BBN-3231; SATR-1) Avail: NTIS CSCL 05/9

The objective of this paper is to develop a theory of Socratic tutoring in the form of pattern-action (or production) rules for a computer program. These pattern action rules are being programmed on a computer system for tutoring causal knowledge and reasoning. The production rules were derived from analysis of a variety of tutorial dialogues. The analysis accounts for the specific teaching strategies used by the tutors in the dialogues within a content-independent formalism. The paper includes twenty-three production rules derived from the data analyzed. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N76-27878*# Joint Publications Research Service, Arlington, Va.

MAN, THE BIOSPHERE, AND SPACE

Nikolay Aleksandrovich Agadzhanyan Washington NASA Jul.

1976 17 p refs Transl. into ENGLISH from Priroda (USSR), no. 4, Apr. 1976 p 4-13
(NASA Order W-13183)
(NASA-TT-F-15495) Avail: NTIS HC $3.50 CSCL 06S

Several medical and biological problems in the flights of the manned space stations are discussed, including the different atmospheres used in U.S. and U.S.S.R. spacecraft, the problems of transferring crew members between the Soyuz and Apollo spacecraft with the different atmospheres, the microbe exchange and fungi experiments on the Soyuz-Apollo mission, and physiological problems on long space flights, including details for the Russian cosmonauts who were on the Soyuz-Apollo and the Soyuz-Salyut flights. Possible applications of the results of space medical research to terrestrial health problems and the future possible colonization of interplanetary space are also discussed. Author

N76-27879*# Scientific Translation Service, Santa Barbara, Calif.
LIVING AND WORKING IN SPACE
L. A. Gilberg Washington NASA Jul. 1976 71 p Transl. into ENGLISH of the mono. "Novoye v Zhizni, Nauke, Tekhnike, Seriya Kosmonavtika, Astronomiya, No. 12.: Zhizn i Rabota v Kosmose" Moscow, Znaniye Press, 1975 p 1-63
(Contract NASw-2791)
(NASA-TT-F-17075) Avail: NTIS HC $4.50 CSCL 05E

Man's work in space has a number of specific characteristics and occurs under extremely unusual conditions: in weightlessness, with large g-forces, in the absense of an atmosphere. The problems of human adaptation to such conditions and to questions of the life support system of cosmonauts are discussed. A number of developments in this field in the U.S.S.R. and abroad are given. Author

N76-27880*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REAL-TIME DETECTION AND DATA ACQUISITION SYSTEM FOR THE LEFT VENTRICULAR OUTLINE Ph.D. Thesis - Stanford Univ.
Johan Hendrickus Christiaan Reiber Washington Jun. 1976 311 p refs
(NASA-TR-R-461; A-6292) Avail: NTIS HC $9.75 CSCL 06P

To automate the data acquisition procedure, a real-time contour detection and data acquisition system for the left ventricular outline was developed using video techniques. The X-ray image of the contrast-filled left ventricle is stored for subsequent processing on film (cineangiogram), video tape or disc. The cineangiogram is converted into video format using a television camera. The video signal from either the TV camera, video tape or disc is the input signal to the system. The contour detection is based on a dynamic thresholding technique. Since the left ventricular outline is a smooth continuous function, for each contour side a narrow expectation window is defined in which the next borderpoint will be detected. A computer interface was designed and built for the online acquisition of the coordinates using a PDP-12 computer. The advantage of this system over other available systems is its potential for online, real-time acquisition of the left ventricular size and shape during angiocardiography. Author

N76-27881*# Joint Publications Research Service, Arlington, Va.
IN UNEXPECTED SITUATIONS: COSMONAUT TRAINING
N. Fefelev Washington NASA Jun. 1976 8 p ref Transl. into ENGLISH from Aviat. Kosmonavt (USSR), no. 5, May 1976 p 40-41
(NASA-TT-F-17078) Avail: NTIS HC $3.50 CSCL 05H

Unexpected spacecraft flight emergency situations that can occur were tackled by a ground central backup crew personnel. Simulated malfunctions on a spacecraft mockup were performed and recommendations were radioed to an orbiting crew. Specifically, the Apollo-Soyuz space mission is given as an example, and the emergency procedures followed during that mission are reviewed. Topics discussed are: (1) use of hypnosis to combat space flight fatigue, (2) use of stimulants to combat space flight fatigue, and (3) psychophysiological factors that influence work capacity and mental alertness in performing such functions as stellar navigation, control and communications, and meteorological tasks. Author

N76-27882# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
AIR PASSENGER COMFORT. A STUDY ABOUT COMFORT IN GENERAL AND FOR AIR PASSENGERS IN PARTICULAR
G. B. M. Mathot Nov. 1975 33 p refs
(FOK-K-66a) Avail: NTIS HC $4.00

A model for air passenger comfort to be used by aircraft designers and manufacturers is defined. The model takes into account elements such as noise, side to side motion, and aesthetics; relations between these elements; and processes such as influence of civilizations, social groups, marketing, and pressure groups. Recommendations for further research and design improvements are suggested. ESA

N76-27883# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
THE USE OF TRITIUM GAS IN LIGHT SOURCES
J. B. T. Aten Aug. 1975 25 p refs In DUTCH; ENGLISH summary
(Contract A73/KL/048)
(MBL-1975-18; TDCK-66735) Avail: NTIS HC $3.50

Radioactive luminous paints have frequently been used for the illumination of objects like dials and pointers. For some years new light sources, known as betalights, became available. Military applications of these betalights are known and are to be expected at a large scale in the future. Attention is given to the radiological health implications of these light sources, proposals for health physics measures are given, and the way in which legal regulations can be satisfied are discussed. Author (ESA)

N76-27852 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Applied Vision Section.
EYE PROTECTION AND PROTECTIVE DEVICES
D. H. Brennan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 8 p ref (For availability see N76-27846 18-52)

N76-27853 Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Flight Systems Section.
HELMET MOUNTED SIGHTS AND DISPLAYS
John Laycock *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p refs (For availability see N76-27846 18-52)

N76-27854 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
WARNING SYSTEMS IN AIRCRAFT CONSIDERATIONS FOR MILITARY OPERATIONS
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p refs (For availability see N76-27846 18-52)

N76-27857 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PHYSIOLOGICAL LIMITATIONS TO HIGH SPEED ESCAPE
David H. Glaister *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p refs (For availability see N76-27846 18-52)

N76-27858 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PRINCIPLES AND PROBLEMS OF HIGH SPEED EJECTION
A. J. Barwood *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 4 p (For availability see N76-27846 18-52)

N76-27859 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
CURRENT AND FUTURE ESCAPE SYSTEMS
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

N76-27860 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
HELICOPTER ESCAPE AND SURVIVABILITY
D. C. Reader *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

N76-27861 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE PHYSIOLOGY OF HIGH G PROTECTION
B. J. Lisher *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p refs (For availability see N76-27846 18-52)

N76-27862 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
A COMPARISON OF RECENT ADVANCES IN BRITISH ANTI-G SUIT DESIGN
J. W. Davies *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 3 p refs (For availability see N76-27846 18-52)

N76-27863 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL PROBLEMS IN MILITARY AIR OPERATIONS
J. R. Allan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

N76-27865 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL PROBLEMS IN HIGH PERFORMANCE AIRCRAFT
J. R. Allan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p ref (For availability see N76-27846 18-52)

N76-27866 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PERSONAL THERMAL CONDITIONING
Craig Saxton *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 6 p (For availability see N76-27846 18-52)

N76-27867 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
CABIN PRESSURISATION AND OXYGEN SYSTEMS-REQUIREMENTS
J. Ernsting *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 5 p refs (For availability see N76-27846 18-52)

N76-27868 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
SEAT MOUNTED OXYGEN REGULATOR SYSTEMS IN UNITED KINGDOM AIRCRAFT
A. J. F. MacMillan *In* AGARD 4th Advanced Operational Aviation Med. Course May 1976 2 p (For availability see N76-27846 18-52)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N76-27884*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-FC AND HAL/S-360 COMPILER SYSTEM PROGRAM DESCRIPTION
13 May 1976 839 p refs
(Contract NAS9-13864)
(NASA-CR-147797; IR-182-1) Avail: NTIS HC $21.25 CSCL 09B

The compiler is a large multi-phase design and can be broken into four phases: Phase 1 inputs the source language and does a syntactic and semantic analysis generating the source listing, a file of instructions in an internal format (HALMAT) and a collection of tables to be used in subsequent phases. Phase 1.5 massages the code produced by Phase 1, performing machine independent optimization. Phase 2 inputs the HALMAT produced by Phase 1 and outputs machine language object modules in a form suitable for the OS-360 or FCOS linkage editor. Phase 3 produces the SDF tables. The four phases described are written in XPL, a language specifically designed for compiler implementation. In addition to the compiler, there is a large library containing all the routines that can be explicitly called by the source language programmer plus a large collection of routines for implementing various facilities of the language. Author

N76-27885*# Auburn Univ., Ala. Engineering Experiment Station.
RELIABILITY AND COVERAGE ANALYSIS OF NON-REPAIRABLE FAULT-TOLERANT MEMORY SYSTEMS Final Technical Report
G. W. Cox and B. D. Carroll 1 Jul. 1976 106 p refs
(Contract NAS8-26930)
(NASA-CR-149942) Avail: NTIS HC $5.50 CSCL 09B

A method was developed for the construction of probabilistic state-space models for nonrepairable systems. Models were developed for several systems which achieved reliability improvement by means of error-coding, modularized sparing, massive replication and other fault-tolerant techniques. From the models developed, sets of reliability and coverage equations for the systems were developed. Comparative analyses of the systems were performed using these equation sets. In addition, the effects of varying subunit reliabilities on system reliability and coverage were described. The results of these analyses indicated that a significant gain in system reliability may be achieved by use of combinations of modularized sparing, error coding, and software error control. For sufficiently reliable system subunits, this gain may far exceed the reliability gain achieved by use of massive replication techniques, yet result in a considerable saving in system cost. Author

N76-27886# North Carolina Univ., Chapel Hill. Dept. of Computer and Information Science.
REMOTE MANIPULATORS AS A COMPUTER INPUT DEVICE M.S. Thesis
J. J. Capowski 1971 71 p refs Sponsored by ERDA
(TID-26886) Avail: NTIS HC $6.75

As part of the Grope project, a study of computer-user communication utilizing the sense of kinesthesia, a pair of remote

manipulator arms was set up in a master-slave mode. A digital computer system samples voltages present in the supporting electronic system of the manipulators. The user communicates to the computer through the manipulator system, using his motor skills controlled by his kinesthetic sense. The major problems are that the manipulator arms are not good computer I/O devices and that little is known about the kinesthetic sense from a human factors engineering standpoint. Author (ERA)

N76-27887# Stanford Univ., Calif. Stanford Electronics Labs.
STACK WORKING SET: A CHARACTERIZATION OF SPATIAL LOCALITY
B. R. Rau Jul. 1975 66 p refs
(Contract AT(04-3)-326)
(SU-SEL-75-037; SU-326-P39-2; TR-95) Avail: NTIS HC $5.50

Multilevel memory hierarchies present far greater problems than two-level hierarchies when it comes to analytic performance evaluation. The page size varies with the level in the hierarchy, and the request streams that the lower (slower) levels see are the fault streams out of the immediately higher levels. The request stream seen by each level is not necessarily the same as the one generated by the processor. A model for program behavior, which explicitly characterizes the spatial locality of the program, is proposed and validated. It is shown that the spatial locality of a program is an invariant of the hierarchy when characterized in this manner. This invariance is used to solve the first problem stated -- that of the varying page sizes. An approximate technique is advanced for the characterization of the fault stream as a function of the request stream and the capacity of the level. A procedure is then outlined for evaluating the performance of a multilevel hierarchy analytically. Author (ERA)

N76-27888# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf.
IBM 360/30-PDP 11/20 COMPUTER AND SIMULATION OF THE IBM 1130/1800 PLOTTER SUBROUNTINES USING THIS COUPLING
G. M. Jakubczyk Jan. 1975 56 p refs In GERMAN
(SGAE-2408) Avail: ERDA Depository Libraries HC $5.50

A PDP 11/20 can be used as a front end processor for the IBM 360/30. According to a project which is forthcoming, the tasks of the front end processor will be handling of a plotter and a display for the /360, processing of tapes for the /360, telecommunication with a commercial computer, and control of other telecommunication lines later on. Compared with this project, the plotting system described here is a simple preliminary version which enables users to keep their existing IBM 1130 plotting programs with slight changes and to go on programing in their familiar language, until the demanding new system is finished. Author (ERA)

N76-27889# California Univ., Berkeley. Lawrence Berkeley Lab.
OVERVIEW OF IRATE: INTERACTIVE RETRIEVAL AND TEXT EDITOR
M. Leavitt and C. M. Lederer Sep. 1975 13 p refs Sponsored in part by NBS
(Contract W-7405-eng-48)
(LBL-4607) Avail: NTIS HC $4.00

A remote terminal entry/editing system for complex technical text or structured data was developed. The system was tested in varied applications. The IRATE hardware and software are discussed in brief, and its operational features are described. Some examples of IRATE-produced documents are shown, and potential future development of the system is discussed. Author (ERA)

N76-27890# Stanford Univ., Calif. Digital Systems Lab.
FUNCTIONAL DESCRIPTION OF THE EMMY MAIN MEMORY SYSTEM
Charles Neuhauser 25 Aug. 1975 16 p
(Contract AT(04-3)-326; Grant AF-AFOSR-2865-75; AF Proj. 9769)
(AD-A021148; TN-57; AFOSR-76-0016TR) Avail: NTIS CSCL 09/2

This document gives the functional description of an emulation oriented main memory system for use on the EMMY bus system. The main memory system consists of a byte addressable core memory system and a memory controller which performs elementary transformations on address and data under CPU control. Author (GRA)

N76-27891# Pennsylvania Univ., Philadelphia. Dept. of Decision Sciences Management.
ASAP TO REL: EFFICIENT RELATIONAL DATA BASES FROM VERY LARGE FILES Interim Report
O. Peter Buneman and Howard L. Morgan Jan. 1975 20 p refs
(Contracts N00014-67-A-0216-0007; NR Proj. 049-272; NR Proj. 049-360)
(AD-A020648; Rept-75-01-06) Avail: NTIS CSCL 05/2

Recently, several very powerful interactive question answering systems have become available. In general, these systems permit the user to pose questions in English or some formal language and will perform searches through a data base which is structured as a set of relations. These searches may involve deductive or inferential logic ability. There are two major difficulties which inhibit the widespread use of such systems. First, these systems typically deal only with a 'small' number of relations, e. g., less than 1,000,000. The data bases which we wish to query in real life are usually much larger. Second, the creation of the relational data base itself is often quite time consuming. In this paper, the problem is discussed of taking a very large data base stored in conventional rectangular form, i.e., all data elements dealing with one entity (name, address, phone, balance, for example) which are stored contiguously, selecting a subset of interest, and reformatting it into a relational data base which can be used by a question answering system. GRA

N76-27892# San Diego State Univ., Calif.
THE GRAPHICS TERMINAL DISPLAY SYSTEM: A POWERFUL GENERAL-PURPOSE CAI PACKAGE Technical Report, Jun. 1974 - Apr. 1975
Frederick Wm. Hornbeck and Lynn Brock Dec. 1975 64 p refs
(Contract N61339-73-C-0184; PF55522002)
(AD-A020814; NPRDC-TR-76-25) Avail: NTIS CSCL 05/9

The report describes a system developed to support research and development in computer-based instruction. A powerful and versatile CAI language was developed which allows authors to present materials on a graphic display, on slides, or by means of voice synthesizer. The language was developed on an IBM 360/50 computer and is transportable to other similar machines. Comparisons are made between this system and others, such as PLANIT, PLATO, and TICCIT. GRA

N76-27893# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
A SPARSITY-ORIENTED APPROACH TO THE DESIGN OF MECHANICAL SYSTEMS Interim Report
Nikki Orlandea and Donald A. Calahan 1975 36 p refs
(Grant AF-AFOSR-2812-75; AF Proj. 9749)
(AD-A020734; AFOSR-76-0014TR) Avail: NTIS CSCL 12/1

In this paper, the systematic formulation of the equations of motion for three-dimensional mechanical systems (mechanisms) is considered in view of sparsity requirements for large simulation problems. Topological approaches of previous authors are extended to include the practical case of joint-constraints, and the resultant formulation is also related to Lagrange multiplier methods. Finally, a simulation example of a three-dimensional landing system model is studied several times larger than heretofore state-of-the-art problems and the growth rate of computation time with problem size is noted. Author (GRA)

N76-27894# National Bureau of Standards, Washington, D.C. Office of Information Processing Standards.
GUIDELINES FOR BENCHMARKING ADP SYSTEMS IN THE COMPETITIVE PROCUREMENT ENVIRONMENT Final Report
John F. Wood 15 Dec. 1975 11 p
(PB-249586/9; FIPS-PUB-42) Avail: NTIS HC $3.50 CSCL 09B

General guidelines are presented to be used by Federal agencies as best practices of benchmark mix demonstrations for validating hardware and software performance in context with

processing the users' expected actual workload. The selection of the benchmark mix, sanitation of the benchmark mix, planning for the benchmark mix demonstration, and conducting the benchmark mix demonstration are treated. GRA

N76-27895# Mitre Corp., Bedford, Mass.
JOBSTREAM SEPARATOR: SUPPORTIVE INFORMATION, VOLUME 2
J. M. Schacht Jan. 1976 125 p
(Contract F19628-76-C-0001; AF Proj. 522D)
(AD-A020521; MTR-3022-Vol-2; ESD-TR-75-354-Vol-2) Avail: NTIS CSCL 09/2

The Jobstream Separator (JSS) has been proposed to automate the manual process used to change security levels at AFWWMCC sites assessment. This volume provides detailed requirements and design analysis information in support of the technical and economic assessment of the JSS presented in Volume I. Author (GRA)

N76-27896# Stanford Univ., Calif. Dept. of Computer Science.
VERIFICATION VISION WITHIN A PROGRAMMABLE ASSEMBLY SYSTEM: AN INTRODUCTORY DISCUSSION
Robert C. Bolles Dec. 1975 85 p refs
(Contract DAHC15-75-C-0435; ARPA Order 2494)
(AD-A020943; SU-STAN-CS-75-537; SU-AIM-275) Avail: NTIS CSCL 09/2

This paper defines a class of visual feedback tasks called Verification Vision which includes a significant portion of the feedback tasks required within a programmable assembly system. It characterizes a set of general-purpose capabilities which, if implemented, would provide a user with a system in which to write programs to perform such tasks. Example tasks and protocols are used to motivate these semantic capabilities. Of particular importance are the tools required to extract as much information as possible from planning and/or training sessions. Four different levels of verification systems are discussed. They range from a straightforward interactive system which could handle a subset of the verification vision tasks, to a completely automatic system which could plan its own strategies and handle the total range of verification tasks. Several unsolved problems in the area are discussed. GRA

N76-27897# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
IMAGE INTENSITY UNDERSTANDING
Berthold K. P. Horn Aug. 1975 87 p refs
(Contract N00014-75-C-0643)
(AD-A021135; AI-M-335) Avail: NTIS CSCL 09/2

Image intensities have been processed traditionally without much regard to how they arise. Typically they are used only to segment an image into regions or to find edge-fragments. Image intensities do carry a great deal of useful information about three-dimensional aspects of objects and some initial attempts are made here to exploit this. An understanding of how images are formed and what determines the amount of light reflected from a point on an object to the viewer is vital to such a development. The gradient-space, popularized by Huffman and Mackworth is a helpful tool in this regard. GRA

N76-27898# Cornell Univ., Ithaca, N.Y. Dept. of Operations Research.
MATHEMATICAL TECHNIQUES FOR EFFICIENT RECORD-SEGMENTATION IN LARGE SHARED DATA BASES
Mark J. Eisner and Dennis G. Severance Jul. 1975 36 p refs
(Contract N00014-75-C-1119; Grants NSF GK-42081; NSF GK-32282)
(AD-A020377; TR-261) Avail: NTIS CSCL 09/2

To minimize the average cost of retrieval from a large shared data base, it is desirable to partition the data items stored within each record into a primary and secondary record segment. Three alternative analytic models, based upon knowledge of data item lengths, transportation costs and retrieval patterns, are developed here to assist an analyst with this assignment problem. First, assuming a known constant of proportionality, k, between the cost of primary segment storage and the value of user satisfaction, the problem is formulated in terms of network flows and solved using the Ford Fulkerson Algorithm. Because a precise determination of k is often difficult, the problem is restated parametrically and solved once again for all possible values of k. It is discovered that as the value of a small primary segment increases from zero, sucessive optimal primary assignments are nested i.e., there is a well defined order in which data items are forced from the primary into the secondary segment. Lastly, a more complex total system cost is proposed as a design objective function. The resulting problem is determined to be a member of the class of bicriterion programming problems. A quick method of approximating an optimal solution is devised. In the event that suboptimality is unacceptable, the problem structure permits the use of an efficient branch and bound enumeration to locate an exact solution. GRA

N76-27899# Stanford Univ., Calif. Digital Systems Lab.
SYSTEM/360 EMULATOR PERFORMANCE ESTIMATE
Walter A. Wallach, Jr. Nov. 1975 14 p refs
(Grant AF-AFOSR-2865-75; Contract AT(04-3)-326; AF Proj. 9769)
(AD-A020746; SU-TN-66; AFOSR-76-0018TR) Avail: NTIS CSCL 09/2

This note describes the performance and instruction timing of the System/360 Emulators for EMMY. General emulator structure and flow are included in a previous report. A detailed description of the final complete Class B emulator will be the subject of a later report. The Stanford EMMY will emulate typical 360 instruction streams at about 97KIPS. A production (Model 2 Control Store) EMMY will achieve 143KIPS on the same instruction stream. A 360 model 50 processes this stream at about 141KIPS. Minor modifications to the Stanford machine should enable it to achieve 120KIPS. Author (GRA)

N76-27900# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
SCENE ANALYSIS: A SURVEY
Carl Weiman Dec. 1975 68 p refs
(Contract N00014-75-C-0571)
(AD-A020700; NSO-9) Avail: NTIS CSCL 09/2

This survey traces the development of scene analysis by computer from its origins in digitized picture processing and pattern recognition. Discussion of diverse approaches is unified by geometric concepts related to projection. A concluding overview contains suggestions for new approaches based on projective geometry and neurophysiological models. The bibliography, available as a deck of Hollerith cards, is organized according to topic and document accessibility. GRA

N76-27268* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
A DISTRIBUTED DATA BASE MANAGEMENT CAPABILITY FOR THE DEEP SPACE NETWORK
A. I. Bryan *In its* The Deep Space Network 15 Jun. 1976 p 32-36 ref (For availability see N76-27262 18-12)
CSCL 09B

N76-27275* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Systems Research Section.
STANDARD INTERFACE: TWIN-COAXIAL CONVERTER
W. A. Lushbaugh *In its* The Deep Space Network 15 Jun. 1976 p 107-111 refs (For availability see N76-27262 18-12)
CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N76-27901*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.
ON THE COMPUTATION AND UPDATING OF THE MODIFIED CHOLESKY DECOMPOSITION OF A COVARIANCE MATRIX
D. L. VanRooy May 1976 27 p refs
(Contract NAS9-12776)

(NASA-CR-147821; Rept-275-025-024; ICSA-275-025-024) Avail: NTIS HC $4.00 CSCL 09B

Methods for obtaining and updating the modified Cholesky decomposition (MCD) for the particular case of a covariance matrix when one is given only the original data are described. These methods are the standard method of forming the covariance matrix K then solving for the MCD, L and D (where K = LDLT); a method based on Householder reflections; and lastly, a method employing the composite-t algorithm. For many cases in the analysis of remotely sensed data, the composite-t method is the superior method despite the fact that it is the slowest one, since (1) the relative amount of time computing MCD's is often quite small, (2) the stability properties of it are the best of the three, and (3) it affords an efficient and numerically stable procedure for updating the MCD. The properties of these methods are discussed and FORTRAN programs implementing these algorithms are listed. Author

N76-27902*# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.

CLASSIFICATION IMPROVEMENT BY OPTIMAL DIMENSIONALITY REDUCTION WHEN TRAINING SETS ARE OF SMALL SIZE

S. A. Starks, R. J. P. DeFigueiredo, and D. L. VanRooy Apr. 1976 6 p refs

(Contract NAS9-12776; Grant AF-AFOSR-2777-75)

(NASA-CR-147822; ICSA-TR-275-025-025; EE-TR-7603) Avail: NTIS HC $3.50 CSCL 09B

A computer simulation was performed to test the conjecture that, when the sizes of the training sets are small, classification in a subspace of the original data space may give rise to a smaller probability of error than the classification in the data space itself; this is because the gain in the accuracy of estimation of the likelihood functions used in classification in the lower dimensional space (subspace) offsets the loss of information associated with dimensionality reduction (feature extraction). A number of pseudo-random training and data vectors were generated from two four-dimensional Gaussian classes. A special algorithm was used to create an optimal one-dimensional feature space on which to project the data. When the sizes of the training sets are small, classification of the data in the optimal one-dimensional space is found to yield lower error rates than the one in the original four-dimensional space. Author

N76-27903*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.

THE USE OF THE WINOGRAD MATRIX MULTIPLICATION ALGORITHM IN DIGITAL MULTISPECTRAL PROCESSING

D. L. VanRooy, R. A. Schafer, and M. S. Lynn May 1976 18 p refs

(Contract NAS9-12776)

(NASA-CR-147823; ICSA-TR-275-025-027) Avail: NTIS HC $3.50 CSCL 09B

The Winograd procedure for matrix multiplication provides a method whereby general matrix products may be computed more efficiently than the normal method. The algorithm and the time savings that can be effected are described. A FORTRAN program is provided which performs a general matrix multiply according to this algorithm. A variation of this procedure that may be used to calculate Gaussian probability density functions is also described. It is shown how a time savings can be effected in this calculation. The extension of this method to other similar calculations should yield similar savings. Author

N76-27904*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.

THE RECURSIVE MAXIMUM LIKELIHOOD PROPORTION ESTIMATOR: USER'S GUIDE AND TEST RESULTS

D. L. VanRooy Jun. 1976 27 p refs

(Contract NAS9-12776)

(NASA-CR-147824; ICSA-TR-275-025-028) Avail: NTIS HC $4.00 CSCL 09B

Implementation of the recursive maximum likelihood proportion estimator is described. A user's guide to programs as they currently exist on the IBM 360/67 at LARS, Purdue is included, and test results on LANDSAT data are described. On Hill County data, the algorithm yields results comparable to the standard maximum likelihood proportion estimator. Author

N76-27905*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CLASSIFICATION SOFTWARE TECHNIQUE ASSESSMENT

Robert R. Jayroe, Jr., Robert Atkinson (Computer Science Corp., Huntsville, Ala.), B. V. Dasarathy (Computer Science Corp., Huntsville, Ala.), Matt Lybanon (Computer Science Corp., Huntsville, Ala.), and H. K. Ramapryian (Computer Science Corp., Huntsville, Ala.) Washington NASA May 1976 153 p refs (Contract NAS8-31639)

(NASA-TN-D-8240; M-172) Avail: NTIS HC $6.75 CSCL 09B

A catalog of software options is presented for the use of local user communities to obtain software for analyzing remotely sensed multispectral imagery. The resources required to utilize a particular software program are described. Descriptions of how a particular program analyzes data and the performance of that program for an application and data set provided by the user are shown. An effort is made to establish a statistical performance base for various software programs with regard to different data sets and analysis applications, to determine the status of the state-of-the-art. Author

N76-27906# United Nuclear Industries, Inc., Richland, Wash.

PROGRAMMING RECORDS DISPOSITION INTO COMPUTER SYSTEMS

B. Schauss 23 Oct. 1975 7 p refs Presented at the ERDA Records Management Conf., Idaho Falls, Idaho

(Contract AT(45-1)-1857)

(UNI-SA-19; Conf-751052-1) Avail: NTIS HC $4.50

The need for disposing of obsolete records (and erasure and re-use of magnetic tapes) in computer systems at definite times and methods for achieving this procedure are discussed. ERA

N76-27907# California Univ., Berkeley. Lawrence Berkeley Lab.

KEYWORD ACCESS TO A MASS STORAGE DEVICE AT THE RECORD LEVEL

Gey F. Mantei 12 Sep. 1975 18 p refs Presented at Intern. Conf. on Very Large Data Bases, Boston, Mass., 22 Sep. 1975

(Contract W-7405-eng-48)

(LBL-4256; Conf-750969) Avail: NTIS HC $4.00

A general software package was built to access individual data records stored on an IBM-1360 photo-digital mass storage device with a current on-line capacity of 50 billion characters (bytes) and an infinitely extensible off-line capacity. An existing data base management system was used to maintain the pointers to the data on the mass storage device and to store the controls for the data driven interactive code. Existing data dictionaries used for sequentially processing the data bases were stored in the DBMS and used to display individual data items within the retrieved records. Data retrieved from the mass storage device is displayed interactively or sent for further processing to various report generation and statistics packages. The system provides dial-up terminal retrieval capability for exceedingly large socio-economic and demographic data bases used by national and regional planning agencies of the federal government. Author (ERA)

N76-27908# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

DESCRIPTION OF THE PROGRAM FMFPJ FOR MINIMIZING A FUNCTION SUBJECT TO CONSTRAINTS

N. Engersbach 25 Aug. 1975 16 p

(DLR-IB-552-75/6) Avail: NTIS HC $3.50

The Functions Minimization using Fletcher Powell and Projection program (FMFPJ), used for solving finite dimensional function minimization problems subject to equality and inequality constraints is described. The method of solution contains the fast convergence properties of the Davidon Fletcher Powell algorithms with the concept of gradient projection to treat constraints. ESA

N76-27909# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

DESCRIPTION OF THE MINFSY PROGRAMS FOR CALCU-

LATING THE COST FUNCTION AND CONSTRAINTS FOR POSITIONING THE SATELLITE SYMPHONIE
N. Engersbach 2 Oct. 1975 15 p refs
(DLR-IB-552-75/7) Avail: NTIS HC $3.50

Computer programs used to calculate cost functions, values of presented constraints, and partial derivatives of both with respect to elements of the minimum fuel parameter set are described for positioning of the Symphonie satellites. A brief explanation of the input, internal operations, and output of each program is outlined. A table giving common block cross references to other subprograms is presented. ESA

N76-27910# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
SICHDI: A PROGRAM FOR VISIBILITY DIAGRAMS FOR SATELLITES WITH LARGE SEMIAXIS. USER MANUAL [SICHDI - EIN PROGRAMM FUER SICHTBARKEITSDIAGRAMME FUER SATELLITEN MIT GROSSER HALBACHSE BENUTZERANWEISUNG]
E. F. Jochim 6 Nov. 1975 43 p refs In GERMAN
(DLR-IB-552-75/14) Avail: NTIS HC $4.00

A program is described which produces line printer printouts of visibility diagrams for satellite transfer orbit analysis. The SICHDI program was used successfully for the Symphonie 1 and 2 satellites. The diagrams supply the following information: indication of apogees, numbering of apogees, TM/TC contact times, tracking contact time for several interferometers, facultative indication of visibilities for pencil type sensor, effect of orbital parameter variation on visibility relations, and facultative simultaneous indication of the visibility relations for several observation stations. The SICHDI program is available as a readily translated operator (binary version). Computing time per orbit over the total time span of 6.1 days is about 7 sec; the program is written in ALGOL 60. ESA

N76-27911# Computer Technology Ltd., Hemel Hempstead (England).
OBC LANGUAGE STUDY
20 Feb. 1976 93 p
(Contract ESTEC-2466/75-HP)
(ESA-CR(P)-805) Avail: NTIS HC $5.00

A study on a suitable language and computer system for the efficient and reliable production of the software for the ESA owned onboard computer (OBC) was made. The OBC environments application and programming are discussed. Various programming languages are detailed and the reasons the CORAL 66 language on a CTL Modular One computer recommended are given. The facilities of the CORAL 66 language system may be used in the implementation of applications and support software for the OBC is shown. Brief technical definitions of the language similar to the Backus-Naur format and characteristics of the implementation are given. ESA

N76-27912# European Space Research and Technology Center, Noordwijk (Netherlands).
THE COMPRESSION OF PARTICLE COUNT DATA BY USE OF THE FAST HADAMARD TRANSFORM
R. Okkes 1975 12 p refs Presented at the Digital Signal Process. Conf., Florence, 9-11 Sep. 1975
Avail: NTIS HC $3.50

Data reduction methods are considered which aim at extracting only significant information from the data samples required to reconstruct the count rate intensity value as a function of time. A useful parameter extraction method is also described. It is shown that the Hadamard transform is a powerful tool for extracting significant data from data samples perturbed by a Poisson noise process. Results of applying one of the proposed methods to some typical examples are mentioned. ESA

N76-27913# Science Applications, Inc., Palo Alto, Calif.
USER'S GUIDE FOR THE WAM-BAM COMPUTER CODE
F. L. Leverenz and H. Kirch Jan. 1976 46 p refs Sponsored by Elec. Power Res. Inst.
(PB-249624/8; EPRI-217-2-5) Avail: NTIS HC $4.00 CSCL 18I

This report contains the information needed to use the WAM-BAM computer codes. These codes were developed to evaluate probabilistically, systems modeled with complex Boolean algebra. A common example is a fault tree, whose gates, with WAM-BAM, can be any Boolean function (i.e., AND, OR, NAND, NOR, NOT). The current version operates on the CDC 6600 and CDC 7600 computers and requires 170000(base 8) words of storage. ERA

N76-27914# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
TYPE 19 ACCOUNTING RECORDS: DATA REDUCTION AND ANALYSIS PROGRAMS Interim Report, 1 Jul. 1972 - 30 Sep. 1975
Terry G. Hahn and K. B. Irani Nov. 1975 183 p refs
(Contract F30602-73-C-0001; AF Proj. 5581)
(AD-A020220; RADC-TR-75-291) Avail: NTIS CSCL 09/2

Type 19 records are generated as a service by operating system (GCOS) for the Honeywell 635 computer. The five programs described within this report organize information from type 19 accounting records into a form suitable to drive and validate a GCOS Time Sharing System (TSS) simulation. NEWREC, DATCOL, DATPLOT, PROFILE, and DUMPER run on an IBM 370/168 under the Michigan Terminal System at the University of Michigan. Use is made of both the software routines and the peripheral plotting hardware available under MTS. NEWREC is written in IBM 370 assembler, and the remaining programs are written in FORTRAN. GRA

N76-27915# Mitre Corp., Bedford, Mass.
THE HYBRID PROGRAM MEASUREMENT DEVICE: DESIGN AND CAPABILITIES
D. A. Voorhies Jan. 1976 96 p
(Contract F19628-76-C-0001; AF Proj. 572C)
(AD-A020993; MTR-3105; ESD-TR-75-368) Avail: NTIS CSCL 09/2

External hardware may be employed to monitor an executing computer program at the instruction level without interfering with that execution in any way. Software may be used to control the external hardware, making the measurement process far simpler and easier to use. The Hybrid Program Measurement Device is useful for program debugging and optimization. Its capabilities and design are described in this MTR, together with its implications and some recommendations for future work. GRA

N76-27916# Stanford Univ., Calif. Dept. of Computer Science.
A NEW APPROACH TO RECURSIVE PROGRAMS
Zohar Manna and Adi Shamir Dec. 1975 29 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2494)
(AD-A021055; SU-STAN-CS-75-539; SU-AIM-276) Avail: NTIS CSCL 09/2

In this paper, the authors critically evaluate the classical least-fixed point approach towards recursive programs. They suggest a new approach which extracts the maximal amount of valuable information embedded in the programs. The presentation is informal, with emphasis on examples. GRA

N76-27917# Stanford Univ., Calif. Digital Systems Lab.
PROPOSED ENHANCEMENTS TO EMMY
Lee W. Hoevel and Walter A. Wallach, Jr. Nov. 1975 8 p refs
(Grant AF-AFOSR-2865-75; AF Proj. 9769)
(AD-A020733; SU-TN-67; AFOSR-76-0017TR) Avail: NTIS CSCL 09/2

Current and projected versions of the Stanford EMMY are outlined. A number of changes to the organization of EMMY are suggested, based on work done to date. The changes improve the utility of the processor as an emulation vehicle. Author (GRA)

N76-27918# Naval Underwater Systems Center, New London, Conn.
PRELIMINARY REFERENCE MANUAL FOR PROGRAM STAMP (STATISTICS OF ACOUSTIC MEASUREMENTS AND PREDICTIONS)
George Botseas and John Skory Feb. 1976 127 p refs
(NUSC Proj. A-650-02; SF52552701)
(AD-A020742; NUSC-TD-5259) Avail: NTIS CSCL 09/2

STAMP (Statistics of Acoustic Measurements and Predictions) is a UNIVAC 1108 program which performs statistical analysis of series data for sonar and communications systems applications. The statistical tests are especially chosen and tailored for requirements of acoustic data analysis. Data such as propagation loss at equal or unequal intervals of range, time, or depth and in any format are suitable for input into the STAMP program. The scope of statistical analysis covers one and two dimensional analysis of variance and linear regression analysis with identification and removal of significant polynomial components of variance (trends). Both parametric and non-parametric analyses are employed to describe the statistical characteristics of the basic data set and to make confidence and reliability statements about (1) individuals of a distribution, (2) means, and (3) variances. Statistics related to the amplitudes by which a given threshold is exceeded and the intervals for which it is exceeded are also calculable by the STAMP program. Stationarity of means, variances, and distributions are a basic type of analysis. Although the program's emphasis is on statistics, STAMP includes a variety of other general-purpose functions that extend its processing capabilities. GRA

N76-27273* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Data Systems Development Section.
SIMPLE INTUITIVE MODELS OF PROGRAMMING
R. C. Tausworthe *In its* The Deep Space Network 15 Jun. 1976 p 85-95 refs (For availability see N76-27262 18-12)
CSCL 09B

N76-27274* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Data Systems Development Section.
SOFTWARE PRODUCTION METHODOLOGY TESTED PROJECT
R. C. Tausworthe *In its* The Deep Space Network 15 Jun. 1976 p 96-106 refs (For availability see N76-27262 18-12)
CSCL 09B

N76-27278* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN PERFORMANCE TESTS OF A MAXIMUM LIKELIHOOD DECODER
J. M. Urech, L. D. Vit, and C. A. Greenhall *In its* The Deep Space Network 15 Jun. 1976 p 131-146 refs (For availability see N76-27262 18-12)
CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N76-27919# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
A CLASS OF STORAGE MANAGEMENT SYSTEMS [EINE KLASSE VON SPEICHERVERWALTUNGSSYSTEMEN]
W. Schulze Sep. 1975 53 p refs In GERMAN; ENGLISH summary
(Rept-233) Avail: NTIS HC $4.50

A generalization from the buddy system, the m-system, which is based on the theory of linear difference equations, is treated. In addition to algorithms for storage allocation, a model with special distribution of block sizes is presented for the estimation of internal fragmentation. An application case demonstrates the approximate equality of the internal fragmentation in this example and in that special model. Author (ESA)

N76-27920# European Space Research and Technology Center, Noordwijk (Netherlands).
COMPUTER SYSTEMS FOR SPACELAB
Gordon R. Bolton 1975 14 p refs Presented at the Brit. Interplanet. Soc. Conf. on Computer Tech. in Space Proj., London, 24 Sep. 1975 Submitted for publication
Avail: NTIS HC $3.50

The primary task of the general purpose system is the submission of the basic subsystem by computer control for both normal operation to reduce or eliminate operator workload, and for checkout. The computing capability should be able to detect failure within itself and the subsystems. ESA

N76-27921# European Space Research and Technology Center, Noordwijk (Netherlands).
THE SPACELAB COMPUTER SYSTEM
G. R. Bolton 1975 17 p refs Presented at the 8th Intern. Aerospace Instr. Symp., Cranfield, Engl., 23-27 Mar. 1975
Avail: NTIS HC $3.50

The design of the computer system for Spacelab is discussed. It is a general purpose system for use by subsystems and experimenters and provides onboard basic service to the experimenters and low cost checkout facilities prior to space flight. ESA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N76-27922# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
TRANSITION NETWORKS FOR PATTERN RECOGNITION Interim Report
Su May Chou and K. S. Fu Dec. 1975 190 p refs
(Grant AF-AFOSR-2661-74; AF Proj. 9769)
(AD-A020727; TR-EE75-39; AFOSR-76-0133TR) Avail: NTIS CSCL 09/2

Transition networks along with a discussion of their relationships to grammars of Chomsky's hierarchy is studied. The modified Earley's parsing algorithm for transition network grammars is also presented. A transition network is a model for a grammar. It provides perspicuity in expression and allows efficient parsing algorithms. The stochastic and error correcting versions of transition networks are also presented. The approach of stochastic error correcting transition network analysis is proposed to solve the problem of noise and distortion in syntactic pattern recognition. The advantages of this approach are discussed in detail and illustrated by an experiment on voice-chess language. Finally, an approach to the inference of transition networks is proposed. The inference on the probability assignment over the arcs of stochastic transition networks is also discussed. The inference techniques are illustrated by examples. GRA

N76-27923# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.
OPTIMIZATION TECHNIQUES FOR FEATURE EXTRACTION IN AUTOMATIC PATTERN RECOGNITION Annual Progress Report
Rui J. P. DeFigueiredo 31 Dec. 1975 12 p refs
(Grant AF-AFOSR-2777-75; AF Proj. 9769)
(AD-A020997; AFOSR-76-0106TR) Avail: NTIS CSCL 09/2

This report summarizes progress on 'Optimization Techniques for Feature Extraction in Automatic Pattern Recognition.' Work has progressed along two main lines - extraction of optimal linear features from Gaussian pattern classes and optimal nonlinear features from non-Gaussian pattern classes. Considerable progress in the former has been made and an appropriate reference is made to the research for determining the optimal single linear feature. Progress has also been made in the latter case. The status is briefly described. GRA

N76-27924# Stanford Univ., Calif. Dept. of Computer Science.
PRODUCTION RULES AS A REPRESENTATION FOR A KNOWLEDGE-BASED CONSULTATION PROGRAM
Randall Davis Oct. 1975 42 p refs
(Contract DAHC15-73-C-0435; Grants PHS-GM-29662; PHS-HS-01544; PHS-GM-10922; ARPA Order 2494)
(AD-A019641; SU-AIM-266; SU-STAN-CS-75-519) Avail: NTIS CSCL 09/2

The MYCIN system has begun to exhibit a high level of performance as a consultant on the difficult task of selecting antibiotic therapy for bacteremia. This report discusses issues of representation and design for the system. Describe the basic task and document the constraints involved in the use of a program as a consultant. The control structure and knowledge representation of the system are examined in this light, and

special attention is given to the impact of production rules as a representation. The extent of the doma in independence of the methodology is also examined. GRA

N76-27925# Maryland Univ., College Park. Computer Science Center.
VISUAL TEXTURE ANALYSIS: AN OVERVIEW
Azriel Rosenfeld Aug. 1975 15 p refs
(Contract F44620-72-C-0062)
(AD-A020686; AFOSR-76-0125TR; TR-406) Avail: NTIS CSCL 09/2

Over the past 20 years, many measures have been proposed for characterizing and discriminating visual textures. This paper reviews some of these measures, and gives a selected bibliography on the subject. GRA

N76-27926# Maryland Univ., College Park. Computer Science Center.
PICTURE RECOGNITION AND SCENE ANALYSIS
Azriel Rosenfeld and Joan S. Weszka Sep. 1975 50 p refs
(Contract N00014-75-C-0286)
(AD-A020688; TR-407) Avail: NTIS CSCL 09/2

This paper reviews some of the milestones in the development of techniques for the computer analysis of pictures and scenes. Topics covered include preprocessing (noise cleaning, deblurring, filtering); segmentation (region growing, decomposition of regions into parts, grouping of regions into 'objects'); property measurement (invariant properties, textural properties); shape analysis (local shape features, boundary and skeleton representations); and structural analysis (syntactic analysis, model matching). The emphasis is on describing representative ideas that are of historical importance, rather than on giving a systematic treatment of the subject. GRA

N76-27927# Ohio State Univ., Columbus. ElectroScience Lab.
PATTERN RECOGNITION TECHNIQUES FOR RADAR AIRCRAFT IDENTIFICATION
S. N. Srihari and L. J. White Arlington, Va. AFOSR Aug. 1975 158 p refs
(Grant AF-AFOSR-2611-74; AF Proj. 9769)
(AD-A020754; ESL-3815-2; AFOSR-76-0145TR) Avail: NTIS CSCL 17/9

Some problems concerning the design and evaluation of a pattern recognition system for low-frequency radar aircraft identification are investigated. A decision-theoretic model that includes a model of noise perturbations of the feature-vector, and a model of uncertainty associated with the measurement of parameter values has been developed. The performance of the minimum-risk classifier based on the decision-theoretic model is compared to those of the nearest-neighbor classifiers. This comparison is made in terms of the following measures: misclassification probability, classification bias, computational efficiency and robustness. A feature-extraction algorithm based on the decision-theoretic model is developed. Alternative procedures for the problem where multiple radar scans are available have been compared. These procedures include a sequential procedure based on the decision-theoretic model, and a procedure based on taking a majority-vote over multiple decisions of a given classifier. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N76-27928 Pennsylvania Univ., Philadelphia.
REPRESENTATIONS OF ANTICOMMUTATION RELATION ALGEBRAS Ph.D. Thesis
Bennett Mitchell Baker 1975 159 p
Avail: Univ. Microfilms Order No. 76-12242

A type of fermion observable algebra is studied by examining a simple class of its representations. In particular the (U(1)) gauge invariant subalgebra of the canonical anticommutation relations is viewed as an inductive limit of finite dimensional matrix algebras, and representations induced by restriction of the so-called generalized free states - those which are uniquely determined by their two point functions alone - from the entire canonical anticommutation relations to the smaller gauge invariant subalgebra are considered. Dissert. Abstr.

N76-27929 Southern Illinois Univ., Carbondale.
OSCILLATION, ASYMPTOTIC BEHAVIOR, AND NONCONTINUATION OF SOLUTIONS OF NTH ORDER NONLINEAR DELAY DIFFERENTIAL EQUATIONS Ph.D. Thesis
Wadi Elias Mahfoud 1975 84 p
Avail: Univ. Microfilms Order No. 76-13264

The following types of delay differential equations were studied: (a) X(t) + a(t)f(x(q(t))) = 0, (b) X(t) + a(t)f(x(t),x(q(t))) = 0, and (c) X(t) + a(t)phi (x(t))f(x(q(t))) = 0, where X(t) is the nth order derivative of X with respect to t and n > 2, and all functions involved are continuous. The oscillation and asymptotic behavior of solutions of equation (a) are discussed. The noncontinuation of solutions of equations (b) and (c) when a(t) becomes negative at a point is also considered. Dissert. Abstr.

N76-27930 Columbia Univ. Teachers Coll., New York.
DIFFERENT APPROACHES TO THE STUDY OF PLANE ALGEBRAIC CURVES Ph.D. Thesis
Loreto PorteDePerez 1976 157 p
Avail: Univ. Microfilms Order No. 76-13491

Different approaches to the study of algebraic curves at a level that can be understood by an advanced undergraduate student are presented. The relationships among the procedures are analyzed. A proof of the Puiseux theorem through the use of the results about resolution of singularities and vice versa is given. The characteristic pairs found in the Puiseux expansion are shown to determine completely the kind of knot obtained when intersecting the given curve with a small sphere (C2). Dissert. Abstr.

N76-27931*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZONAL AND TESSERAL HARMONIC COEFFICIENTS FOR THE GEOPOTENTIAL FUNCTION, FROM ZERO TO 18TH ORDER
James C. Kirkpatrick Apr. 1976 11 p ref
(NASA-TM-X-58181; JSC-09429) Avail: NTIS HC $3.50 CSCL 12A

Zonal and tesseral harmonic coefficients for the geopotential function are usually tabulated in normalized form to provide immediate information as to the relative significance of the coefficients in the gravity model. The normalized form of the geopotential coefficients cannot be used for computational purposes unless the gravity model has been modified to receive them. This modification is usually not done because the absolute or unnormalized form of the coefficients can be obtained from the simple mathematical relationship that relates the two forms. This computation can be quite tedious for hand calculation, especially for the higher order terms, and can be costly in terms of storage and execution time for machine computation. In this report, zonal and tesseral harmonic coefficients for the geopotential function are tabulated in absolute or unnormalized form. The report is designed to be used as a ready reference for both hand and machine calculation to save the user time and effort. Author

N76-27932# Stanford Univ., Calif. Dept. of Computer Science.
HYBRID DIFFERENCE METHODS FOR THE INITIAL BOUNDARY-VALUE PROBLEM FOR HYPERBOLIC EQUATIONS
J. Oliger Feb. 1975 31 p refs
(Contract E(04-3)-326)
(SU-326-PA30-39; SU-STAN-CS-75-481) Avail: NTIS HC $5.00

The use of lower-order approximations in the neighborhood of boundaries coupled with higher-order interior approximations is examined for the mixed initial boundary-value problem for, hyperbolic partial differential equations. Uniform error can be maintained using smaller grid intervals with the lower-order approximations near the boundaries. Stability results are presented for approximation to the initial boundary-value problem for the model equation u sub t + cu sub x = 0 which are fourth

order in space and second order in time in the interior and second order in both space and time near the boundaries. These results are generalized to a class of methods of this type for hyperbolic systems. Computational results are presented and comparisons are made with other methods. Author (ERA)

N76-27933# Maryland Univ., Baltimore. Dept. of Mathematics.
ESTIMATION OF DISCRETE-TIME DIRECTIONAL PROCESSES
James Ting-Ho Lo and Linda R. Eshleman Oct. 1975 41 p
(Grant AF-AFOSR-2671-74; AF Proj. 9769)
(AD-A020728; MRR-75-11; AFOSR-76-0113TR) Avail: NTIS CSCL 12/1

Error criteria, probability distributions, and optimal estimates on a sphere are discussed. Some properties of a special representation of a probability density on a sphere are studied. This representation has the desirable feature of being closed under the operation of taking conditional distributions. Facilitated with it, a finite-dimensional recursive scheme can be derived for a simple estimation model for directional processes. GRA

N76-27934# Colorado State Univ., Fort Collins. Dept. of Mathematics.
RELATIVE APPROXIMATION Interim Report
A. Bacopoulos, O. Shisha, and G. D. Taylor 1975 18 p refs
(Grant AF-AFOSR-2878-76; AF Proj. 9749)
(AD-A020691; AFOSR-76-0063TR) Avail: NTIS CSCL 12/1

Let f be a real function, defined and not equal to zero on (-1, 1) and let N be an integer greater than 0. The problem of relative approximation of f by real polynomials 1 (x) of degree less than N is considered. Author

N76-27935# New York Univ., N.Y. Inst. of Mathematical Sciences.
DIFFERENTIAL EQUATIONS: ELECTROMAGNETIC THEORY AND APPLICATIONS TO PROBLEMS OF COMMUNICATIONS AND SURVEILLANCE Final Report, 1 Feb. 1971 - 31 Aug. 1975
Joseph B. Keller 1975 8 p
(Grant AF-AFOSR-2013-71; AF Proj. 9749)
(AD-A021107; AFOSR-76-0115TR) Avail: NTIS CSCL 12/1

The central theme of the research supported by this contract has been the development and application of asymptotic and singular perturbation methods for initial and boundary value problems involving ordinary and partial differential equations. Author (GRA)

N76-27936# Kent State Univ., Ohio. Dept. of Mathematics.
ON THE SHARPNESS OF THEOREMS CONCERNING ZERO-FREE REGIONS FOR CERTAIN SEQUENCES OF POLYNOMIALS
R. Varga and E. B. Saff 1975 19 p refs Prepared in cooperation with Univ. of South Florida
(Grants AF-AFOSR-2729-74; E(11-1)-2075; AF Proj. 9749)
(AD-A021128; AFOSR-76-0012TR) Avail: NTIS CSCL 12/1

In this paper, the authors establish the sharpness of a theorem concerning zero-free parabolic regions for certain sequences of polynomials satisfying a three-term recurrence relation. Similarly, the authors establish the sharpness of a zero-free sectorial region for certain sequences of Pade approximants to (e sup z). GRA

N76-27937# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
REPRESENTATION THEORY FOR LINEAR INFINITE DIMENSIONAL CONTINUOUS TIME SYSTEMS
A. Bensoussan Dec. 1975 24 p refs
(Grants AF-AFOSR-2273-72; NSF GK-41647; AF Proj. 9769)
(AC-A021152; ESL-P-640; AFOSR-76-0126TR) Avail: NTIS CSCL 12/1

Representation theory for finite dimensional systems has been the subject of a great deal of discussion in recent years. In the case of linear systems defined over fields an account of the theory can be found in the books of BROCKETT and KALMAN-FALB-ARBIB and in the case of systems defined over rings in the book of EILENBERG, the papers of ROUCHALEAU-WYMAN-KALMAN, ROUCHALEAU-WYMAN and the thesis, of JOHNSTON. Over the past three years a body of results for linear infinite dimensional systems has been developed. Here two lines of enquiry have been pursued. Author (GRA)

N76-27938# Union Coll., Schenectady, N.Y. Inst. of Administration and Management.
TRUNCATED SEQUENTIAL PROCEDURES FOR COMPLETE RANKING OF SEVERAL BINOMIAL POPULATIONS Ph.D. Thesis Final Report, 1 Jan. - 31 Dec. 1975
Ramesh Chandra 31 Dec. 1975 64 p refs
(Contract N00014-75-C-0583; NR Proj. 042-302)
(AD-A021205; AES-7513) Avail: NTIS CSCL 12/1

This study deals with the problem of complete ranking of k binomial populations. Developed are two truncated test procedures for handling two situations, namely (a) when the distance between populations is measured in terms of the odds ratio, (b) when it is measured in terms of difference (delta sub ij). Since no fixed sample size or truncated sequential procedure (in which the termination number is prespecified) exists for this purpose, a two-stage procedure is proposed. GRA

N76-27939# Michigan State Univ., East Lansing. Dept. of Mathematics.
RATIONAL APPROMIXATION WITH APPLICATION IN SIMULATION Final Report, 1 Jul. 1972 - 30 Dec. 1975
Gerald D. Taylor 1975 5 p
(Grant AF-AFOSR-2271-72; AF Proj. 9749)
(AD-A021110; AFOSR-76-0116TR) Avail: NTIS CSCL 12/1

This report provides a listing of papers prepared under the subject research grant. Author (GRA)

N76-27940# Texas Inst. for Computational Mechanics, Austin.
MIXED-HYBRID FINITE ELEMENT APPROXIMATIONS OF SECOND-ORDER ELLIPTIC BOUNDARY-VALUE PROBLEMS
I. Babuska, J. T. Oden, and J. K. Lee Dec. 1975 48 p refs
(Grant AF-AFOSR-2660-74; AF Proj. 9782)
(AD-A021109; AFOSR-75-1704TR) Avail: NTIS CSCL 21/1

Mixed-hybrid finite element approximations are described for second-order elliptic boundary-value problems in which independent approximations are used for the solution and its gradient on the interior of an element and the trace of the gradients on the boundary of the element. This leads to nonconforming finite elements. The independent boundary approximations are introduced by means of Lagrange multipliers. Apriori error estimates are derived. Several other finite element models are also obtained as special cases. Author (GRA)

N76-27941# Minnesota Univ., Minneapolis. Center for Control Sciences.
LINEAR HEREDITARY CONTROL SYSTEMS
E. B. Lee 1976 29 p refs
(Grant AF-AFOSR-2243-72; AF Proj. 9769)
(AD-A021153; AFOSR-76-0127TR) Avail: NTIS CSCL 12/1

Relationships between external and internal models for systems with time lags are discussed. The use of various canonical forms for the models in solving optimal control problems is considered. Author (GRA)

N76-27942# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF THE NUMERICAL METHOD OF FINITE ELEMENTS FOR DIGITAL COMPUTER DETERMINATION OF GREEN'S FUNCTIONS M.S. Thesis
John W. Rice, Jr. Dec. 1975 212 p refs
(AD-A021000; GNE/PH/75-21) Avail: NTIS CSCL 12/1

The feasibility of using the numerical method of finite elements for digital computer determinations of Green's functions was investigated in this thesis. A study of Poisson's equation, the Helmholtz equation, and the diffusion equation in one and two dimensions was conducted using the CDC 6600 computer. Both Dirichlet and mixed boundary conditions were considered. The Green's functions numerically determined by the finite element method were compared with those found by the analytical method and the finite difference method for accuracy. The numerical and analytical Green's functions were also used in the solution of several boundary value problems, and the accuracy of the results were compared. The results of the study indicated that although for Poisson's equation, the finite element method

produced the same results as the finite difference method, the finite element method was more time consuming. For the Helmholtz and diffusion equations, the finite element method again required more computations, but in most cases gave greater accuracy. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N76-27943*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.

A QUASI-NEWTON APPROACH TO OPTIMIZATION PROBLEMS WITH PROBABILITY DENSITY CONSTRAINTS

R. A. Tapia and D. L. VanRooy Jun. 1976 41 p refs

(Contract NAS9-12776)

(NASA-CR-147825; ICSA-TR-275-025-029) Avail: NTIS HC $4.00 CSCL 12A

A quasi-Newton method is presented for minimizing a nonlinear function while constraining the variables to be nonnegative and sum to one. The nonnegativity constraints were eliminated by working with the squares of the variables and the resulting problem was solved using Tapia's general theory of quasi-Newton methods for constrained optimization. A user's guide for a computer program implementing this algorithm is provided. Author

N76-27944# Rome Univ. (Italy). Inst. of Aeronautical Constructions.

STRUCTURAL AND CORRELATION PROPERTIES OF Q-ARY MAXIMAL LENGTH LINEAR RECURRING SEQUENCES

Giorgio Ravelli Apr. 1974 50 p refs

(Rept-41) Avail: NTIS HC $4.00

The general class of maximal length linear recurring sequences is described and analyzed. The base of the number system considered is any prime number q greater or equal to 2 and the order is any integer k greater or equal to 2. The main characteristics and properties of these sequences such as the structural and randomness characteristics, the properties of operations on the sequences and the correlation properties, are examined in detail. Methods for the determination of coefficients of the recurrence relations which generate the sequences are presented. Author (ESA)

N76-27945# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.

BASIS OF THEORY OF DETECTION AND ESTIMATION [FONDEMENTS DE LA THEORIE DE LA DETECTION ET DE L'ESTIMATION]

J. L. Lacoume 6 Nov. 1975 48 p In FRENCH

(CEPHAG-49/75) Avail: NTIS HC $4.00

The foundations of the classical detection theory are presented. For optimization criteria, the Bayes criterion was studied and correlated to the signal to noise ratio thus leading to a specified structure for the optimal reception. The minimax technique and sequential tests method were not considered. Two types of optimal receptors are discussed, the linear one with regard to colored noise and white noise including a wash out filter. The quadratic receptor is shown to be optimal for purely random signals. ESA

N76-27946# California Univ., Irvine. School of Engineering.

OPTIMAL REGULATION OF STOCHASTIC LINEAR SYSTEMS WITH ADJUSTABLE PARAMETERS

James S. Meditch and R. F. Roberts Dec. 1975 8 p refs Presented at the 1975 Conf. on Decision and Control, Houston, Tex., 10-12 Dec. 1975

(Grant AF-AFOSR-2116-71; AF Proj. 9769)

(AD-A021154; AFOSR-76-0128TR) Avail: NTIS CSCL 12/1

The problem of optimal regulation for stochastic linear systems with adjustable plant parameters is examined and posed as a nonlinear programming problem. A computational procedure, built around the Generalized Reduced Gradient algorithm, is developed to solve the associated plant-controller design problem. The procedure is illustrated via a lateral autopilot design in which the quality of regulation is improved by approximately 18% over that achievable with a nominal fixed plant Author (GRA)

N76-27947# Brown Univ., Providence, R.I. Div. of Applied Mathematics.

GENERAL CONVERGENCE RESULTS FOR STOCHASTIC APPROXIMATIONS VIA WEAK CONVERGENCE THEORY

Harold J. Kushner Feb. 1976 26 p refs

(Contract N00014-76-C-0279; Grant AF-AFOSR-2078-71; NR Proj. 041-411)

(AD-A021159) Avail: NTIS CSCL 12/1

Using results in the theory of weak convergence of measures and in stability theory for ordinary differential equations, we prove some general convergence theorems for the sequences of random variables which are generated by algorithms of the stochastic approximation type. Such algorithms are used when one wishes to locate, via a recursive Monte-Carlo method, a minimum of a function, under handicap of noisy data. Algorithms for both constrained and unconstrained optimization problems will be considered, and for rather general noise processes. Author (GRA)

N76-27948# Florida State Univ., Tallahassee. Dept. of Statistics.

RANK ORDER ESTIMATION WITH THE DIRICHLET PRIOR

Gregory Campbell and Myles Hollander Dec. 1975 30 p refs

(Grant AF-AFOSR-2581B-74; AF Proj. 9769)

(AD-A021098; FSU-Statistics-M360; AFOSR-76-0067TR; TR-56) Avail: NTIS CSCL 12/1

Suppose that a sample of size n from a distribution function F is obtained. However, only r(< n) arbitrary values from the sample are observed, say X sub 1, ..., X sub r. Let g prime denote the rank of X sub 1 among X sub 1, ..., X sub r. The problem is to estimate the rank order G of X sub 1 among X sub 1, ..., X sub n. Here F is assumed to be a random distribution function chosen according to Ferguson's Dirichlet process prior. Average ranks are used to resolve ties. A Bayes estimator (squared-error loss) of G is derived and shown to compare favorably with estimators for the nonrandom F model. The comparisons are on the bases of mean square errors and consistency under both the random and nonrandom models. Author

N76-27949# Florida State Univ., Tallahassee. Dept. of Statistics.

NONPARAMETRIC ESTIMATION DISTRIBUTION FUNCTIONS

Mules Hollander and Ramesh M. Korwar Dec. 1975 23 p refs

(Grant AF-AFOSR-2581-74; AF Proj. 9769)

(AD-A021102; FSU-Statistics-M361; AFOSR-76-0066TR; TR-57) Avail: NTIS CSCL 12/1

The nonparametric estimation of n + 1 distribution functions F sub 1, F sub 2, ..., F sub n + 1 is considered on the basis of samples X sub i = (X sub i1, ..., X sub im(1)) from F sub i, i=1, ..., n + 1. In an empirical Bayes context X sub i, ..., X sub n were the past samples, an estimator of F sub n + 1 is proposed that utilized all n + 1 samples. The estimator is developed for the equal sample size cases. Here the Korwar-Hollander estimator is generalized to the unequal sample sizes case, and exploited for simultaneous estimation of F sub 1, F sub 2, ..., F sub n + 1. A necessary and sufficient condition is established for the proposed estimator to be better (riskwise) than using, for each distribution, the corresponding empirical distribution function as an estimator. One sufficient condition, easily obtained from the necessary and sufficient conditions, is nXmin(m sub 1, m sub 2, ..., m sub n + 1) less than max(m sub 1, m sub 2, ..., m sub n + 1). Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N76-27950 Oklahoma State Univ., Stillwater.
SMOOTHABILITY IN BANACH SPACES Ph.D. Thesis
Daniel Campbell Kemp 1975 54 p
Avail: Univ. Microfilms Order No. 76-9699

A study is made of a geometric property of Banach spaces called smoothability. The original definition of smoothability is reformulated and examined first in general to determine its invariance properties and secondly in the classical Banach spaces as a source of examples. Smoothability is then compared to the well known geometric property of dentability with the objective of determining whether or not any general relationship between the two concepts exists. Dissert. Abstr.

N76-27951# Florida Univ., Gainesville. Center for Mathematical System Theory.
REST POINT THEOREMS FOR AUTONOMOUS CONTROL SYSTEMS Interim Report
M. L. J. Hautus, Michael Heymann, and Ronald J. Stern Sep. 1975 25 p
(Contract DAHC04-76-G-0011; Grant AF-AFOSR-2268-72; AF Proj. 9769)
(AD-A020731; AFOSR-76-0042TR) Avail: NTIS CSCL 12/1

The classical Poincare-Bendixson theory in the plane is generalized to multivalued vector fields. For control systems x = f(x,u) where the state x is in R(n) subset and the control u is valued in a compact subset of R(m) we study the existence (and nonexistence) of rest states. Some special emphasis is focused on the case n = 2. GRA

N76-27952# Army Materiel Command, Redstone Arsenal, Ala. SAM-D Project.
THE BOUNDARY IDENTITY OF EXACT OPPOSITES, A SIMPLE SOLUTION TO THE AGE-OLD PHILOSOPHICAL PROBLEM OF CHANGE
Thomas E. Bearden 8 Oct. 1975 11 p refs
(AD-A020798; SAM-D-76-3) Avail: NTIS CSCL 12/1

This report presents a discussion of the age-old philosophical problem of change. The principle of the boundary identity of exact opposites is proposed as a fundamental correction to the logic law of the excluded middle. This fundamental principle is shown to resolve the philosophical problem of change, the wave/corpuscle dichotomy, and several other logical difficulties in foundations of mathematics and foundations of physics. GRA

N76-27953# Wisconsin Univ., Madison.
AN INTRODUCTION TO RESPONSE SURFACE METHODOLOGY
G. E. P. Box Jul. 1964 21 p refs
(Contract N00014-75-C-0562; Nonr-12202(17))
(AD-A021180; WU-TR-33) Avail: NTIS CSCL 12/1

A statistical technique for the design and analysis of experiments that seeks to relate an average response to the values of quantitative variables that affect response is described. Author

N76-27954# Stanford Univ., Calif. Dept. of Computer Science.
GRAPH THEORY AND GAUSSIAN ELIMINATION
Robert E. Tarjan Nov. 1975 25 p refs
(Grant NSF DCR-72-03752; NR Proj. 044-402)
(AD-A020848; SU-STAN-CS-75-526) Avail: NTIS CSCL 12/1

This paper surveys graph-theoretic ideas which apply to the problem of solving a sparse system of linear equations by Gaussian elimination. Included are a discussion of bandwidth, profile, and general sparse elimination schemes, and of two graph-theoretic partitioning methods. Algorithms based on these ideas are presented. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N76-27955*# Kanner (Leo) Associates, Redwood City, Calif.
THEORY OF DIFFRACTION
Walter Franz Munster Washington NASA Jul. 1976 46 p refs Transl. into ENGLISH from Z. Phys. (Berlin), v. 125, 1949 p 563-596
(Contract NASw-2790)
(NASA-TT-F-17080) Avail: NTIS HC $4.00 CSCL 20N

An approximation technique is reported for solving the acoustic and optical diffraction problem. It contains Kirchhoff's diffraction theory as a special case of the first approximation. While only diffraction by a black screen can be handled by Kirchhoff's method, the new technique also makes allowance for reflection and refraction. Moreover, the technique is not restricted to short wave lengths. As an example, the first and second approximations are carried out for a perfectly reflecting halfplane, and the higher approximations for a small perfectly reflecting sphere. Author

N76-27956# Materials Research Labs., Maribyrnong (Australia).
THE SOURCES OF ERROR IN A FREE OSCILLATION TORSION PENDULUM
John G. Williams Jan. 1976 26 p refs
(Rept-647) Avail: NTIS HC $4.00

The function and operation of a Clanor torsion pendulum are described and the sources and magnitude of errors involved in its use with polymeric materials are discussed. Values of five per cent overall experimental reliability in determination of loss properties and ten per cent in determination of modulus values were determined. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N76-27957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OTW NOISE CORRELATION FOR VARIATIONS IN NOZZLE/WING GEOMETRY WITH 5:1 SLOT NOZZLES
U. VonGlahn and D. Groesbeck 1976 18 p refs Presented at the 3d Aero-Acoustic Conf., Palo Alto, Calif., 20-23 Jul. 1976; sponsored by AIAA
(NASA-TM-X-73425; E-8763) Avail: NTIS HC $3.50 CSCL 20A

Acoustic data obtained from a model-scale study with 5:1 slot nozzles are analyzed and correlated in terms of apparent noise sources. Variations in nozzle geometry include roof angle and sidewall cutback. In addition, geometry variations in wing size and flap deflection are included. Three dominant noise sources were evident in the data and correlated: fluctuating lift noise, trailing edge noise and a redirected jet mixing noise that included the effect of reflection of jet noise by the surface. Pertinent variables in the correlations include the shear layer thickness and peak jet flow velocity at the trailing edge. Author

N76-27958*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ACOUSTICAL MODELING STUDY OF THE OPEN TEST SECTION OF THE NASA LANGLEY V/STOL WIND TUNNEL

Istvan L. Ver, Douglas W. Andersen, and Donald B. Bliss [1975] 116 p refs
(Contract NAS1-13857)
(NASA-CR-145005; Rept-3179) Avail: NTIS HC $5.50 CSCL 20A

An acoustic model study was carried out to identify effective sound absorbing treatment of strategically located surfaces in an open wind tunnel test section. Also an aerodynamic study done concurrently, sought to find measures to control low frequency jet pulsations which occur when the tunnel is operated in its open test section configuration. The acoustical modeling study indicated that lining of the raised ceiling and the test section floor immediately below it, results in a substantial improvement. The aerodynamic model study indicated that: (1) the low frequency jet pulsations are most likely caused or maintained by coupling of aerodynamic and aeroacoustic phenomena in the closed tunnel circuit, (2) replacing the hard collector cowl with a geometrically identical but porous fiber metal surface of 100 mks rayls flow resistance does not result in any noticable reduction of the test section noise caused by the impingement of the turbulent flow on the cowl. Author

N76-27959# Weapons Research Establishment, Salisbury (Australia).
NOISE AMPLIFICATION DURING ANALYSIS OF AERODYNAMIC HEATING EXPERIMENTS
R. L. Pope Mar. 1976 28 p refs
(WRE-TN-1575(WR/D)) Avail: NTIS HC $4.00

In analysis of free flight experiments where aerodynamic heat transfer to a vehicle surface is derived from temperatures measured on the inner surface of the vehicle skin, degraded results arise from noise in the data and propagation of the noise by the method of analysis. Consequently, any noise in the data is greatly amplified. The effects of noise in the data on a method of solving the inverse heating problem were examined. Procedures are given for minimizing the effects of noise, by choosing a digital filter for preprocessing the data and by choosing suitable values for parameters occurring in the analysis. An illustrative example is included. Author

N76-27960# Southampton Univ. (England). Inst. of Sound and Vibration Research.
THE PROPAGATION OF RAILWAY NOISE IN RESIDENTIAL AREAS
H. S. Gill Feb. 1975 120 p refs
(ISVR-TR-73) Avail: NTIS HC $5.50

The propagation of railway noise in residential areas for two commonly occurring situations was investigated: shielding by typical two-storey terraced houses parallel to the railway line, and propagation of railway noise between two rows of two-storey terraced houses perpendicular to the railway line. The investigations were made through a series of field measurements in residential areas. Conclusions have been drawn from the analyses of the recordings; analyses being for spectral and peak dB(A). Investigation was also made into the transmission loss of railway noise through a window. Transmission losses of approximately 29 dB(A) and 11 dB(A) were obtained for a closed window and an open window respectively. Author (ESA)

N76-27961# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SOUND WAVE REFLECTION IN CHANNEL FLOW ON A DISCONTINUITY IN THE WALL IMPEDANCE [REFLEXION VON SCHALLWELLEN IN DURCHSTROEMTEN KANAELEN AN EINER UNSTETIGKEIT DER WANDIMPEDANZ]
Klaus Brod Jul. 1975 68 p refs In GERMAN
(Rept-5/1975) Avail: NTIS HC $4.50

The reflection and transfer of sound wave modes on a discontinuity in an infinitely long wall of a channel with throughflow were investigated assuming the disappearance of an exponentially decaying Rayleigh wave in flow direction, and wall sound pressure behavior on both sides of the discontinuity without this assumption. A partial differential third order equation is derived for the pressure perturbations from the linearized hydrodynamic basic equations. Assuming harmonic time dependency of these perturbations, a relation for the pressure is obtained from the Wiener Hopf method, enabling the required coefficients to be represented by zeros and poles of the solution equation of an ordinary linear differential equation. ESA

N76-27962# Naval Surface Weapons Center, White Oak, Md.
DEPTH SCALING OF UNDERWATER EXPLOSION SOURCE LEVELS Final Report
Joel B. Gaspin 2 Dec. 1975 17 p
(AD-A020473; NSWC/WOL/TR-75-182) Avail: NTIS CSCL 20/1

A new method of depth scaling underwater explosion source levels is presented. The method involves modification of the negative phases of the explosion pressure-time history. The method is shown to be accurate for depth change of an order of magnitude, and frequencies greater than twice the bubble pulse fundamental frequency. This technique is most easily applied to digital data, and is useful in situations where only a minimal investment of time and effort is possible. Scaling by means of a constant time (or frequency) scale factor is shown to be inadequate for large depth changes. Author (GRA)

N76-27963# Picatinny Arsenal, Dover, N.J.
SOME PHYSICS RELEVANT TO ACOUSTIC SHOCK WAVE IMPENDANCE CALCULATIONS
Paul Harris Oct. 1975 37 p refs
(DA Proj. 1T6-1101-A-91A)
(AD-A021089; PA-TR-4902) Avail: NTIS CSCL 20/1

The problem of energy transmission across a boundary separating acoustically linear and nonlinear media is considered to third order in the strain (third order elastic constant). The study proceeds via the contribution of the first harmonic (the input signal being the fundamental) to the stress tensor. It is concluded that the nonlinearity introduces a correction of approximately a few percent (for most crystalline materials), at ten kilobars input amplitude, in comparison to the infinitesimal amplitude impedance matching relations. Special materials, such as potassium iodide (KI), are found to have a twenty-seven percent nonlinearity correction at ten kilobars. The problem of relaxation (both thermal and mechanical) contributions to the propagation velocity of a strain-driven thermal disturbance is considered. It is shown that the relaxation model employed plays a significant role in determining the magnitude of the propagation velocity as a function of time (as compared to the magnitude of the relaxation time). The relaxation mechanism considerations have possible bearing upon the existence of nonsteady-state shock effects as predicted by Tsai and co-workers. Author (GRA)

N76-27964# Singer Co., Glendale, Calif. Librascope Div.
ARRAY TRACKING STUDY Final Report
31 May 1975 7 p
(Contract N00014-74-C-0325; NR Proj. 005-100)
(AD-A020699; Rept-6506) Avail: NTIS CSCL 20/1

Describes performance and testing of a towed acoustic array. GRA

N76-27965# University of Southern Calif., Los Angeles. Allan Hancock Foundation.
SOME COMPARISONS BETWEEN OCEANOGRAPHIC MEASUREMENTS AND HIGH-FREQUENCY SCATTERING (100kHz) OF UNDERWATER SOUND
Richard E. Pieper Nov. 1975 22 p refs Presented at Workshop, Monterey, Calif., Nov. 1975
(Contracts N00014-67-A-0269; N00014-75-C-0683; NR Proj. 104-965; NR Proj. 083-349)
(AD-A020484) Avail: NTIS CSCL 20/1

High-frequency scattering of underwater sound at a frequency of 100 kHz is discussed in relation to hydrographic macrostructure and microstructure (vertical) in the ocean. Data are presented which show scattering layers to be located at or near depths of density interfaces and chlorophyll maxima. Patches of scattering are also discussed and are related to the non-homogeneous distribution (patchiness) of organisms. Author (GRA)

N76-27966# Bendix Corp., North Hollywood, Calif. Electrodynamics Div.
DIGITAL COMPUTER PROGRAMS FOR ANALYZING ACOUSTIC SEARCH PERFORMANCE IN REFRACTIVE WATERS Research and Development Report, Feb. - Nov. 1975

H. C. Bertucelli Dec. 1975 211 p
(Contract N00123-74-C-1615)
(AD-A020722; NUC-TP-164-Vol-3) Avail: NTIS CSCL 20/1

This volume documents changes made in the SONAR programs and the RAYSRT program since publication of Volumes 1 and 2 of NUC TP 164 in December of 1969. Some of the changes are cosmetic; some correct flaws previously undetected because the associated features had not been tested. Most of the changes, however, relate to the preparation by SONAR (either version) of two output tapes processed by other programs, one of which is RAYSRT. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N76-27967*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTRACTION AND SEPARATION OF A PREFERENTIALLY PHOTO-DISSOCIATED MOLECULAR ISOTOPE INTO POSITIVE AND NEGATIVE IONS BY MEANS OF AN ELECTRIC FIELD Patent Application
H. E. Wilhelm, inventor (to NASA) (Colo. State Univ.) Filed 3 Jun. 1976 11 p
(Grant NGR-06-02-147)
(NASA-Case-LEW-12465-1; US-Patent-Appl-SN-692413) Avail: NTIS HC $3.50 CSCL 07D

A photochemical reactor is reported that contains ion extractors for separating isotopes of a gaseous mixture according to their excitation levels. Molecules were photodissociated by a laser and an ultraviolet source, or by multi-photon absorption of laser radiation. Resultant ions were extracted from the photodissociation region by means of screening and accelerating grids for collection in ducts. NASA

N76-27968# Joint Publications Research Service, Arlington, Va.
GAS-KINETIC ANALYSIS OF MULTICOMPONENT VACUUM SYSTEMS BY THE METHOD OF EQUIVALENT SURFACES
B. D. Ershov and G. L. Sakaganskii 1974 16 p refs Transl. into ENGLISH from Russian Preprint A-0219, 10 Sep. 1974 Sponsored by ERDA
(ERDA-TR-72; Preprint-A-0219) Avail: NTIS HC $4.00

A method is proposed for the analysis of molecular flows in complicated vacuum systems. Essentially, it involves the transposition of solutions for a number of elemental structural components. The basic analytic relationships and tables are given and the method is illustrated by analyzing a specific system. Author (ERA)

N76-27969# European Space Agency, Paris (France).
THE CALCULATION OF FLOW FIELDS AROUND THREE-DIMENSIONAL BODIES AT HIGH ALTITUDES (FREE MOLECULAR FLOW OF NEUTRAL ATOMS)
Walter Wuest Feb. 1976 56 p refs Transl. into ENGLISH of 'Die Berechnung von Stroemungsfeldern um dreidimensionale Koerper in grosser Hoehe (freie Molekuelstroemung neutraler Atome)', DFVLR, Goettingen, West Ger. Report DLR-FB-75-45, 26 May 1975 Original German report available from DFVLR, Cologne DM 32.30
(ESA-TT-254; DLR-FB-75-45) Avail: NTIS HC $4.50

On bodies with single molecular reflection (i.e. bodies with plane walls or surfaces of convex curvature) in free molecular flow the local forces and the flow field can be calculated explicitly. On bodies with multiple molecular reflection (e.g., bodies with surfaces having concave curvature) where from one point on the surface another one can be seen, an interaction of the diffusely reflected molecules occurs, and this is calculated for some simple shapes. Author (ESA)

N76-27970# Tetra Tech, Inc., Pasadena, Calif.
INTERACTION OF A HOLLOW SPHERE HAVING A CIRCULAR APERTURE WITH AN ELECTRON MOVING IN AN ARBITARY TRAJECTORY EXTERIOR TO THE SPHERE Final Report, Apr. - Jun. 1974
A. D. Varvatsis and M. I. Sancer Apr. 1975 95 p refs
(Contract F29601-74-C-0120)
(AD-A020369; AFWL-TR-74-184) Avail: NTIS CSCL 20/3

The effect of the moving electron on the field quantities in the interior of the sphere is calculated in the quasi-static approximation. Suitable field quantities are plotted versus the normalized distance of the electron from the center of the sphere with the aperture size, angular position and velocity components of the electron as parameters. GRA

N76-27971# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
THEORETICAL ASSIGNMENTS OF THE ELECTRONIC STATES OF NITROUS OXIDE Interim Report
Nicholas W. Winter 30 Jan. 1976 22 p refs
(Contract F04701-75-C-0076)
(AD-A020958; SAMSO-TR-76-28) Avail: NTIS CSCL 20/10

The results of accurate configuration interaction calculations on the excited states of N2O are used to provide accurate assignments of the observed excitation features. Current assignments of the N2O spectra are compared, and results for the higher-lying valence states are presented. The best values obtained for the excitation energies of the valence states are reported. A comparison of the Hartree-Fock, INDO, and configuration interaction methods is also provided. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N76-27972 Pennsylvania State Univ., University Park.
HOT NUCLEAR MATTER Ph.D. Thesis
Russell Woolman Evans 1975 120 p
Avail: Univ. Microfilms Order No. 76-10724

The equation of state and species concentrations of a hot neutral gas of neutrons, electrons, positrons, and muons are determined in the temperature range 5 x 10 to the 10th power to 5 x 10 to the 11th power K and density range 5 x 10 to the 10th power to 10 to the 14th power g/cu cm. The gas is considered to be in local chemical and thermal equilibrium. A virial expansion is constructed to include second order statistical and dynamical terms, the latter through experimental nucleon-nucleon scattering phase shifts. Coulomb effects are included by a many body method. Decreases in pressure and increases in electron population are found to be quite modest. The neutrino opacity of the gas is calculated using transport theory and a variational method and is found to agree closely with the calculations of Bahcall. The validity of the assumption of chemical equilibrium is examined and verified. Dissert. Abstr.

N76-27973# Committee on Science and Astronautics (U. S. House).
ADVANCED NUCLEAR RESEARCH
Washington GPO 1974 77 p refs Hearing before Subcomm. on Aeronautics and Space Technol. of Comm. on Sci. and Astron., 93d Congr., 2d Sess., No. 32, 7 Feb. 1974
(GPO-34-091)

Hearings on aeronautics and space technology are presented before the Subcommittee on Aeronautics and Space Technology. The objectives of the hearings are to obtain a better understanding of how the results of nuclear power and propulsion research and development will be kept available for use in the future, to determine how NASA and the AEC will maintain a viable long-range capability in advanced nuclear power and propulsion research and to resolve the manner in which both past and future research can be incorporated in applications for solving problems related to energy and other terrestrial applications. L.S.

N76-27974# Brookhaven National Lab., Upton, N.Y.
PROCEEDINGS OF THE 1975 ISABELLE SUMMER STUDY. VOLUME 1: SUMMARY REPORTS OF WORKING GROUPS

J. C. Herrera, ed. and A. M. Thorndike, ed. 1975 196 p refs Proc. held at Upton, N. Y., 14-25 Jul. 1975 Sponsored by ERDA 2 Vol.
(BNL-20550-Vol-1; Conf-750737-P1) Avail: NTIS HC $7.50

The concepts which have gone into the 'Proposal for the construction of a 200 GeV proton-proton storage accelerator facility' were reviewed. Specific topics in the areas of experimental physics and particle accelerator design were studied by fifteen working groups. Summaries from these groups as well as contributions from individual authors are presented. For individual titles, see N76-27975 through N76-27986.

N76-27975 State Univ. of New York, Stony Brook.
INITIAL AND LOW-LUMINOSITY EXPERIMENTS
M. L. Good *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 1-8 refs (For availability see N76-27974 18-73)

A number of suitable experiments related to hadron physics that could be performed with the proposed machine were considered. These fall into the following areas: (1) total cross section measurements, (2) multiplicity distributions and short range correlation studies, (3) elastic scattering, (4) single particle spectra, and (5) new particle searches. Two specific insights were gained: (1) very special, rather bizarre beam pipe shapes are needed for optimal performance in different experiments, (2) the systematic use of asymmetric beam energies adds an extra dimension of flexibility from which almost every experiment considered seems to benefit. The proposed machine should enable us to discover either new massive particles or to observe the violation of hallowed selection rules. Y.J.A.

N76-27976 Brookhaven National Lab., Upton, N.Y.
DESIGN OF A LEPTON DETECTOR FOR ISABELLE
R. Burnstein (IIT), W. C. Carithers (Rochester Univ.), M. Duong-van (Stanford Linear Accelerator Center), R. Imlay (Wis. Univ.), M. Kreister (Mass. Univ.), U. Nauenberg (Colo. Univ.), C. Rubbia (Harvard Univ.), L. Sulak (Narvard Univ.), H. H. Williams (Penn. Univ.), E. Paschos et al *In its* Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 9-51 refs (For availability see N76-27974 18-73)

The design of a particle detector intended to look for the most characteristic signature of high transverse momentum leptons was presented. The device may be used for either single lepton or dilepton searches and has sufficient solid angle coverage to be able to deduce the existence of secondary neutrinos via the imbalance in transverse momentum. The detector was also designed with the capability of identifying both electrons and muons. It was concluded that the detector should be constructed simultaneously with the ISABELLE ring itself, with at least the muon magnet section, participating in the first round of the physics program. As the physics program progressed, sections of the inner modules and end caps could be added gradually. Y.J.A.

N76-27977 Brookhaven National Lab., Upton, N.Y.
LARGE EQUIPMENT AND FACILITIES
L. Rosenson (MIT), S. Ting (MIT), J. Russell (Southeastern Mass. Univ.), W. Selove (Penn. Univ.), S. Lindenbaum, W. Love, R. Louttit, S. Ozaki, F. Paige, E. Platner et al *In its* Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 52-69 refs Sponsored in part by NSF (For availability see N76-27974 18-73)

Various elements and general considerations pertaining to a general purpose modular multiparticle spectrometer system for studying many hadronic interactions were briefly described and discussed, including (1) high mass resonances, (2) inclusive and various exclusive reactions, (3) various correlation experiments, (4) some particular investigations of an unusual nature which appear in the strong interactions such as strangeness violation and other violation of various conservation laws, and (5) investigation of large transverse momentum events and jet phenomena. Although the study of hadronic interactions was emphasized, the solenoidal magnet vertex detector system may be used in a search for W bosons and other weak interaction processes. Y.J.A.

N76-27978 Brookhaven National Lab., Upton, N.Y.
EXPERIMENTAL INSERTIONS
J. Sandweiss (Yale Univ.), T. F. Kycia et al *In its* Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 70-83 refs (For availability see N76-27974 18-73)

The current plan for experimental insertion was verified as being viable; this was done by selecting a large number of experiments and determining from the detailed layouts whether they could be incorporated in the current design. A secondary goal was to identify the limitations which the present design imposes on the experimental utilization of the machine, with particular emphasis on trying to find any particular problems or limitations which would be serious enough to require fundamental change in the design. It was concluded that the insertion design does indeed satisfy all the experimental requirements. The features of the experiments which are particularly relevant to the insertion design were described, as well as the kind of insertion required. These experiments include the measurement of total cross-sections and the study of charged particles angular distribution, multiplicity, rapidity, for low values of the transverse momentum. Y.J.A.

N76-27979 Columbia Univ., New York.
NEW AND UNTHINKABLE IDEAS
L. M. Lederman et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 84-110 refs (For availability see N76-27974 18-73)

Various possible processes that may take place following the interaction of protons with energy in the range of 100 to 400 GeV were explored and discussed. These include new symmetry violations (such as violations of baryon number, charge, or both), and the search for new objects. Some experimental approaches required to observe these processes were then described, including a transition detector to detect the presence of electrons. The conceptual design for a new object detector incorporating the following properties was presented: wide angular acceptance, high rate capability, high mass resolution over a large range of masses, flexible triggering arrangement, measurement of charges of all objects, and study of the interaction and decay properties of new objects. The following areas were also explored: search for heavy leptons, identification of super-massive particles decaying solely into very many hadrons, production of anti-nuclei, and metastable neutral particle arm. Y.J.A.

N76-27980 California Univ., Berkeley. Lawrence Berkeley Lab.
LATTICE
L. Smith et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 111-116 refs (For availability see N76-27974 18-73)

The following areas were discussed: variants on the standard lattice, special insertions, correction windings, and working line and nonlinear resonances. A number of variants on the basic lattice, involving the removal of cells from the normal part of the lattice and juggling the length of magnets, cells, and insertions in order to maintain a rational relation of circumference to that of the AGS and approximately the same dispersion, were explored but were found to be generally undesirable. Two special insertion problems were considered: the design of a higher (60-70 m) insertion and a study of the orbit-dynamical consequences of replacing one standard insertion by a lower insertion. A number of specific recommendations was established for a configuration of correcting windings involved multipoles. Finally, various problems related to third and fifth order resonances in relation to the tune diagram were discussed. Y.J.A.

N76-27981 Brookhaven National Lab., Upton, N.Y.
BEAM TRANSFER, INJECTION, AND EJECTION
L. C. Teng, A. VanSteenbergen et al *In its* Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 117-125 refs (For availability see N76-27974 18-73)

The following considerations that crucially dominate the design of the injection, ejection, and beam scraper systems were investigated: longitudinal impedance and beam loss in the ISA rings. It was concluded that the impedance sum of all the components involved in the injection, ejection, and beam scraper systems is expected to be less than 1 ohm. A significant effort was directed to the identification and characterization of the normal operational and potential accidental beam losses. Conceptual designs of scraper-absorber combinations were also worked out. It was concluded that all normal operation particle

losses can be absorbed safely in the scraper-absorber system as conceptually designed, that a fast accidental beam dump on the internal absorber at 30 GeV will not damage the absorber or drive the superconducting structure normal, that the same holds true for a fast internal beam dump at 200 GeV, except that the beam absorber would then suffer local damage. Y.J.A.

N76-27982 European Organization for Nuclear Research, Geneva (Switzerland).
STACKING AND ACCELERATION
W. Schnell et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 126-132 refs (For availability see N76-27974 18-73)

The following aspects of the stacking and acceleration of particles were discussed: general considerations, longitudinal stability, and the accelerating RF system. The design problems involved in the transfer of 11 bunches of 5.2 trillion protons from the AGS to ISABELLE at a total energy of 29.4 GeV were considered, including dilution, trajectories, matching, acceleration, and suppression. The problems related to longitudinal stability were elaborated, including a presentation of the appropriate stability criteria; a proposed solution would be the addition of an intermediate storage ring in which ten or so AGS pulses could be stacked prior to transfer to ISABELLE. It was also proposed to rebunch the stacked beam and to accelerate it by a separate RF system operating at the second harmonic, i.e. at f = 202 kHz. The choice of this harmonic is expected to avoid instability of coupled longitudinal bunch oscillations. Y.J.A.

N76-27983 European Organization for Nuclear Research, Geneva (Switzerland).
PERFORMANCE LIMITATIONS
E. Keil et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 133-139 refs (For availability see N76-27974 18-73)

The transverse stability of coasting beams was investigated. This was done by assuming that the actual impedance is (1 + alpha) times the impedance of a smooth resistive chamber wall, at all frequencies. A graph relating the impedance and the frequency was presented and its implications discussed. It was concluded that: (1) the damping rate must exceed the growth rate by a certain factor, (2) the bandwidth of the feedback system must reach into the frequency range where enough Landau damping exists, and (3) one must avoid blowing up the beam by the noise in the feedback system, and this gives the tolerance on the noise. Coupling effects due to the following beam-beam interactions were also considered: the beam-beam tune shift, and the coupled oscillations of the bunched beams. Y.J.A.

N76-27984 Rutherford High Energy Lab., Chilton (England).
MAGNET AND CRYOGENICS
D. B. Thomas et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 140-150 refs (For availability see N76-27974 18-73)

The following objectives were undertaken: (1) to review critically the present status of the BNL superconducting magnet program and future plans with particular reference to ISABELLE, (2) to make recommendations where appropriate on possible technical improvements, future development programs, and areas where cost reduction should be sought. The consensus view of the working group was that no major change was called for in the overall design philosophy of the ISA magnets. A number of recommendations were made concerning steps that should be taken before procurement of 500 or so superconducting magnets for ISABELLE. It was also recommended that an underlying research and development program should be sustained and concentrated on prototypes dipole systems and a single phase helium forced convective cooling system. Areas of potential cost reduction were discussed. Y.J.A.

N76-27985 National Research Council of Canada, Ottawa (Ontario).
VACUUM SYSTEM
J. P. Hobson et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 151-169 refs (For availability see N76-27974 18-73)

An analysis of the vacuum system previously proposed for the ISABELLE particle accelerator was discussed with the objective of answering the question 'are the design parameters acceptable and practical?' The major differences and similarities pertaining to the vacuum system for ISABELLE and ISR were tabulated and discussed. Comments on the following features of the proposed design were then given: beam chamber, materials of walls, specific outgassing rate, background pressures, treatment of materials, mechanical junctions, beam neutralization (Ne/Np), clearing electrodes, net desorption coefficient, pressure measurement, pumps, sectors and valves, leak detection, and bakeout. No fundamental reason was found why the ISABELLE vacuum system design would be unacceptable or impractical. Y.J.A.

N76-27986 European Organization for Nuclear Research, Geneva (Switzerland).
NOVEL MECHANISMS FOR PARTICLE ACCELERATION
W. J. Willis et al *In* Brookhaven Natl. Lab. Proc. of the 1975 ISABELLE Summer Study, Vol. 1 1975 p 170-181 refs (For availability see N76-27974 18-73)

The following possible sources of high-energy particles with an input energy to the beam of the order of 0.5 million kW were discussed: intense relativistic electron beams (IREB), lasers, and explosions. This last possibility was however rejected at the start. Two methods are currently being pursued with IREB: the IREB/cyclotron wave and the IREB space-charge effect, where the former has yet to be resolved. A suggestion that is given is to use the space-charge effect to generate relativistic ions, and then switching to a mode wherein the ion bunch is accelerated by the trailing edge of an electron beam modulated by a powerful laser. A technique based on accelerating electrons by a laser, with phase matching in gaseous helium at one atmosphere, was described. Two forms of laser driven collective accelerators were also presented. Y.J.A.

N76-27987# California Univ., Livermore. Lawrence Livermore Lab.
CONTROLLED FUSION PHYSICS, EXPERIMENTAL
R. F. Post 23 Oct. 1975 14 p refs Presented at ASP Meeting, St. Petersburg, Fla., 10 Nov. 1975 Sponsored by ERDA
(UCRL-77465; Conf-751130-4) Avail: NTIS HC $4.50

A historical review is given of the experimental thermonuclear research program. The role of pinch devices, mirror machines, Tokamak devices, and laser fusion is discussed. NSA

N76-27988# California Univ., Livermore. Lawrence Livermore Lab.
LOW POWER MULTIPLE SHELL FUSION TARGETS FOR USE WITH ELECTRON AND ION BEAMS
J. D. Lindl and R. O. Bangerter 10 Oct. 1975 36 p Presented at the 1st Intern. Topical Conf. on Electron Beam Res. Technol., Albuquerque, New Mexico, 3-6 Nov. 1975 Sponsored by ERDA
(UCRL-77042; Conf-751108-17) Avail: NTIS HC $5.50

Use of double shell targets with a separate low Z, low density ablator at large radius for the outer shell, reduces the focusing and power requirements while maintaining reasonable aspect ratios. A high Z, high density pusher shell is placed at a much smaller radius in order to obtain an aspect ratio small enough to protect against fluid instability. Velocity multiplication between these shells further lowers the power requirements. Careful tuning of the power profile and intershell density results in a low entropy implosion which allows breakeven at low powers. Ion beams appear to be a promising power source and breakeven at 10-20 Terrawatts with 10 MeV alpha particles appears feasible. Predicted performance of targets with various energy sources is shown and comparison is made with single shell targets.
Author (NSA)

N76-27989# Berkeley Scientific Translation Service, Calif.
FUSION REACTORS AS A FUTURE ENERGY SOURCE
W. Seifritz Sep. 1975 60 p Transl. into ENGLISH from Schweiz. Ver. Atomenerg. (Switzerland), no. 10, 1975 Sponsored by ERDA
(UCRL-Trans-10940) Avail: NTIS HC $6.00

A detailed update of fusion research concepts is given. Discussions are given for the following areas: (1) the magnetic confinement principle, (2) UWMAK I: conceptual design for a fusion reactor, (3) the inertial confinement principle, (4) the laser

fusion power plant, (5) electron-induced fusion, (6) the long-term development potential of fusion reactors, (7) the symbiosis between fusion and fission reactors, (8) fuel supply for fusion reactors, (9) safety and environmental impact, and (10) accidents, and (11) waste removal and storage. NSA

N76-27990# Catania Univ. (Italy). Ist. di Fisica.
QUARK CONFINEMENT: HADRONS AS STRONG BLACK-HOLES
E. Recami and P. Castorina Dec. 1975 10 p
(PP-453) Avail: ERDA Depository Libraries HC $3.50

Preliminary work is presented on whether quarks can be confined in hadrons, e.g. in nucleons, as a consequence of the fact that hadrons might be considered as strong black holes, i.e., as black holes due not to a gravitational field interacting with gravitational charges (masses), but to the strong field interacting with the strong charges carried by quarks. NSA

N76-27991# California Univ., Livermore. Lawrence Livermore Lab.
STABILITY AND SYMMETRY REQUIREMENTS OF ELECTRON AND ION BEAM FUSION TARGETS
R. O. Bangerter, J. D. Lindl, C. E. Max, and W. C. Mead 14 Oct. 1975 37 p refs Presented at APS Meeting, St. Petersburg, Fla., 14 Oct. 1975 Sponsored in part by DNA
(Contract W-7405-eng-48)
(UCRL-77048; Conf-751130-6) Avail: NTIS HC $4.50

Considerations of hydrodynamic stability impose severe restrictions on the design of electron and ion beam imploded fusion targets. Furthermore, in order to obtain a sufficiently spherical implosion, many target designs require electron or ion beams having a high degree of spherical symmetry. The stability and symmetry requirements of several recently proposed target designs were studied by numerical simulation using the computer program LASNEX. The ion beam targets studied are more vulnerable to instability than the electron beam targets. Author (NSA)

N76-27992# Princeton Univ., N.J. Plasma Physics Lab.
ION-BEAM-DRIVEN RESONANT ION CYCLOTRON INSTABILITY
H. W. Hendel, M. Yamada, S. W. Seiler, and H. Ikezi Nov. 1975 10 p refs
(Contract E(11-1)-3073)
(MATT-1182) Avail: NTIS HC $4.00

The resonant ion-beam-driven electrostatic ion cyclotron instability is identified. Measured dispersion relation and onset vs. beam energy and density agree with numerical calculations based on a theory which includes beam acoustic terms. After amplitude saturation, velocity space diffusion of the beam ions is observed. Author (NSA)

N76-27993# Sandia Labs., Albuquerque, N.Mex.
STUDY OF REB TARGET IRRADIATION, DEPOSITION, AND IMPLOSION
J. Chang, L. P. Mix, F. C. Perry, M. M. Widner, and J. W. Poukey 1975 32 p refs Presented at the 1st Intern. Topical Conf. on Electron Beam Res. and Tech., Albuquerque, N. Mex., 3 Nov. 1975 Sponsored by ERDA
(SAND-75-5766; Conf-751108-20) Avail: NTIS HC $4.00

Flat targets, spheres, and hemispheres were irradiated with intense REB from the hydra machine to study target loading, ablation, and implosion. A wide variety of experimental techniques were used including X-ray pinhole photography, laser holography, laser velocimetry, and flash X-radiography. The energy absorption mechanism was found to be consistent with classical electron deposition. Variations in target loading and implosion symmetry have been observed and, in particular symmetry of loading can be altered by changing the cathode geometry and anode-cathode spacing. Author (NSA)

N76-27994# California Univ., Livermore. Lawrence Livermore Lab.
COMPARISON OF LASNEX CALCULATIONS WITH EXPERIMENTAL RESULTS OF PARYLENE DISC IRRADIATIONS AT 1.06 MICROMETERS
W. C. Mead, W. L. Kruer, J. D. Lindl, and H. P. Shay 6 Nov. 1975 16 p Presented at the ASP Meeting, St. Petersburg, Fla., 10 Nov. 1975
(Contract W-7405-eng-48)
(UCRL-77139; Conf-751130-14) Avail: NTIS HC $3.50

Calculations are discussed to simulate irradiation of Parylene discs. Using a representation of the experimental beam profile, geometric optics propagation, and an absorption model based on plasma simulations, the scattered light angular intensity distribution can be obtained. The use of suprathermal electron heating spectrum and thermally generated magnetic fields with Braginskii transport coefficients leads to agreement with time integrated X-ray spectra and X-ray spatial distributions. Details of the calculations and comparisons with other models are discussed. Author (NSA)

N76-27995# Interuniversitair Reactor Instituut, Delft (Netherlands).
[ACTIVITIES OF THE INTERUNIVERSITAIR REACTOR INSTITUTE DURING THE ACADEMIC YEAR 1974 - 1975] Annual Report [INTERUNIVERSITAIR REACTOR INSTITUUT JAARVERSLAG 1974-1975 AKADEMISCH JAAR]
31 Jul. 1975 169 p refs In DUTCH
Avail: NTIS HC $6.75

After a general introduction on management, personnel, planning and building, the scientific activities in the fields of radiation physics, reactor physics, chemistry, radiation hygiene, and dosimetry are discussed in detail. Educational activities are outlined and publications, reports, presentations, and scientific missions are listed. ESA

N76-27996# Montpellier Univ. (France). Dept. de Physique Mathematique.
THRESHOLD EFFECTS IN ANNIHILATION PROCESSES
F. M. Renard Feb. 1976 21 p refs
(PM/76/4) Avail: NTIS HC $3.50

The quark exchange diagram is shown to lead to enhancements in the production of quasi-two-body states near their threshold. An application is given for heavy meson production in the 4 to 4.5 GeV bump of the positron electron give hadron reaction cross section. Similar bumps in the 1 to 2 GeV are discussed in the case of N,N bar a final state interaction is added and a sharp peak in N,N bar or pion production cross section is predicted at square root of s equals 2 GeV. A total enhancement of order 10 nb is then obtained in the cross section for positron electron give hadrons reaction. ESA

74 OPTICS

Includes light phenomena.

N76-27997# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
A MODEL FOR EMISSION AND SCATTERING OF INFRARED RADIATION FROM INHOMOGENEOUS COMBUSTION GASES AND PARTICLES
D. Vanderbilt Jun. 1976 49 p refs
(RM-621) Avail: NTIS HC $4.00

A model for treating radiant heat transfer in inhomogeneous media containing both gases and anisotropically scattering particles is presented. Absorption and scattering coefficients are calculated for discrete particle sizes using the Dave treatment of Mie scattering. The model incorporates a one dimensional beam approximation and couples the particulate and gaseous heat transfer equations. An existing gaseous infrared radiation computer code has been updated to include particulate scattering, absorption and emission in its calculation of radiant heat transfer from combustion products and exhaust plumes. It is shown that the present model is an improvement over models which merely add independent computations of gaseous and particulate radiation. Author

N76-27998# Royal Aircraft Establishment, Farnborough (England).
CONTRIBUTIONS TO THE OPTICS OF TURBID MEDIA, PARTICULARLY OF COLLOIDAL METAL SOLUTIONS
G. Mie Feb. 1976 80 p refs Transl. into ENGLISH from Ann. Phys. (Leipzig), v. 25, no. 3, 1908 p 377-445

(RAE-Lib-Trans-1873; BR52557) Avail: NTIS HC $5.00

The problem of calculating the optical properties of turbid media is solved by assuming that the particles can be regarded as spherical and that the turbidity is optically infinitely dilute. This solution is used to explain the coloration of metals in the colloidal state. Author

N76-27999# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A COMBINED PHOTOMETRIC-ASTROMETRIC CATALOG
Laurence G. Taff 19 Dec. 1975 49 p refs
(Contract F19628-76-C-0002; AF Proj. 2128)
(AD-A020966; ESD-TR-75-330; TN-1975-66) Avail: NTIS CSCL 20/6

Lincoln Laboratory is currently engaged in the construction and software development for a semi-automatic electro-optical observatory. An important function will be astrometric and photometric observations of artificial earth satellites. In the process of calibration the collection of astrometric and photometric data on other celestial objects will be an important by-product. For reasons connected with maximizing the semi-automatic nature of the observatory and the design of the photometer both astrometric and photometric standard stars are required. The possibility of a combined catalog was investigated. GRA

N76-28000# Maryland Univ., College Park. Computer Science Center.
IMAGE ENHANCEMENT BY HISTOGRAM TRANSFORMATION
Robert Hummel Sep. 1975 24 p refs
(Contract F44620-72-C-0062; AF Proj. 9769)
(AD-A021155; AFOSR-76-0129TR; TR-411) Avail: NTIS CSCL 20/6

A number of simple and inexpensive enhancement techniques are suggested. These techniques attempt to make use of easily computed local context features to aid in the reassignment of each point's gray level during histogram transformation.
Author (GRA)

N76-28001# Massachusetts Inst. of Tech., Cambridge.
STUDY OF MAGNETO-OPTICAL AND PLASMA EFFECTS IN SOLIDS Final Report
Peter A. Wolff Jan. 1976 19 p refs
(Grant AF-AFOSR-2010-71; AF Proj. 9764)
(AD-A021111; AFOSR-76-0114TR) Avail: NTIS CSCL 20/6

This grant has been concerned with the problems of infrared generation and electron dynamics in solids. It was demonstrated that electron spins, in materials such as n-InSb, provide a strong nonlinearity for mixing laser beams. Two techniques for phase matching this interaction have been developed. In addition, these interactions have been used to study electron spin dynamics in semiconductors. Recently, it was shown that other Raman processes, such as plasmon and impurity scattering, can be used as infrared sources. In suitable materials, plasmon interactions reduce minority carriers into the 10 to the minus 12th power sec range - an effect which could serve as the basis for fast optical shutters. Author (GRA)

N76-28002# Naval Research Lab., Washington, D.C.
DARPA-NRL INTEGRATED OPTICS PROGRAM QUARTERLY TECHNICAL REPORT TO DEFENSE ADVANCED RESEARCH PROJECTS AGENCY Report for 1 Jan. - 1 Aug. 1975
William K. Burns and Thomas G. Giallorenzi Dec. 1975 17 p refs
(DARPA Order 2327; NRL Proj. N01-38)
(AD-A020932; NRL-MR-3185) Avail: NTIS CSCL 20/6

The ARPA-NRL Integrated Optics program is concerned with the development of infrared integrated optics technology and with the development of a single-mode optical data bus. This report summarizes the NRL in-house progress in the area of indiffused $LiNbO_3$ waveguides, separating waveguides for the data bus, and single-mode optical data bus planning. In particular, the results of a theoretical study of separating waveguides are presented. GRA

N76-28003# Particle Measuring Systems, Boulder, Colo.
THE RESPONSE OF OPTICAL ARRAY SPECTROMETERS TO ICE AND SNOW, A STUDY OF PROBE SIZE TO CRYSTAL MASS RELATIONSHIPS Report for 14 Feb. - 15 Aug. 1975
Robert G. Knollenberg 8 Sep. 1975 80 p refs
(Contract F19628-75-C-0141; AF Proj. 627A)
(AD-A020276; AFCRL-TR-75-0494; SR-1) Avail: NTIS CSCL 20/6

This report is a summary of work performed by Particle Measuring Systems, Inc., to study the response of optical array spectrometers to ice and snow crystals. The principle objective of this study was to perform laboratory, field and theoretical studies to establish more appropriate optical array probe particle size-to-mass relationships. The studies involved both 1-D and 2-D optical array spectrometers. The following report briefly describes the work performed and the results. The sections are not necessarily organized in the chronology that they were performed. While it was intended that the theoretical work might be performed prior to field studies it was necessary to modify theoretical models based upon field observations. In many cases, phases of this work proceeded essentially in parallel with considerable readjustment upon integrating all phases of work. GRA

N76-28004# Naval Training Equipment Center, Orlando, Fla.
SUPPLEMENTARY ROUTINES FOR LENS DESIGN BY COMPUTER Report for Aug. 1972 - Aug. 1975
Gottfried R. Rosendahl Sep. 1975 99 p
(AD-A020625; NAVTRAEQUIPC-IH-253) Avail: NTIS CSCL 20/6

The basics and all necessary details of supplementary programs to serve in conjunction with computer programs for lens analysis and design are derived and explained. They provide an extended, mainly first-order analysis of optical systems particularly with respect to practical decision making and remedial actions during the lens design process including requirements for an effective choice of glasses and of boundary conditions for design variables. GRA

N76-28005# Air Force Weapons Lab., Kirtland AFB, N.Mex.
RAYLEIGH SURFACE WAVE DIFFRACTION OF 10.6 MICRON RADIATION Final Report
Edward W. Taylor Dec. 1975 68 p refs
(ILIR Proj. 73-14)
(AD-A020191; AFWL-TR-75-173) Avail: NTIS CSCL 20/6

The objective of this study was to explore the possibility of using a non-permanent grating technique for use in providing a new method for high-energy beam sampling in the infrared. This nontypical approach to the problem offered a degree of flexibility not realized using the standard technique of permanently etched or ruled diffraction gratings for high-powered lasers. The use of permanent diffraction gratings for high-powered laser applications has been significantly advanced during the past few years by the Air Force Weapons Laboratory (AFWL); however, realization of a general grating technique for use with the next generation of high-powered lasers is still under investigation. Another objective of this study was to investigate and compare the interaction parameters of using a Rayleigh wave nonpermanent grating technique with that of a previously investigated nonpermanent grating technique operating on the principle of diffraction within a gas of induced varying refractive index. GRA

N76-28006# Air Force Weapons Lab., Kirtland AFB, N.Mex.
COMPUTING THE OPTICAL PROPERTIES OF MULTILAYER COATINGS Final Report
John S. Loomis Sep. 1975 30 p refs
(AF Proj. 0833)
(AD-A020856; AFWL-TR-75-202) Avail: NTIS CSCL 20/6

A simple FORTRAN subroutine has been written to calculate the optical reflectance and absorptance of a multilayer coating. This subroutine calculates the optical properties for any angle of incidence, wavelength, or coating design. The index of refraction and thickness of each layer plus the index of refraction of the substrate must be specified. GRA

N76-28007# Arizona Univ., Tucson. Optical Sciences Center.
AN INVESTIGATION OF THE DISTRIBUTION OF RADIATION SCATTERED BY OPTICAL SURFACES Final Report, Oct. 1973 - Dec. 1974
Roland V. Shack and James E. Harvey Aug. 1975 120 p refs

(Contract F04701-74-C-0083)
(AD-A020685; SAMSO-TR-75-236) Avail: NTIS CSCL 20/6

The direct application of Fourier transform theory to the problem of surface scatter allows the well-known techniques of linear systems theory to be applied to the scattering process. For surfaces with well-behaved statistics, this approach results in a linear, shift-invariant scattering function that does not change shape with variations in the angle of incidence. The apparatus and technique used for measuring the scattered light distribution from a variety of optical surfaces as a function of angle of incidence is discussed, and the results of experimental measurements are presented and compared with theoretical predictions. GRA

N76-28008# Frankford Arsenal, Philadelphia, Pa.
THE PROCESS AND TECHNIQUES OF MANUFACTURING REPLICA MIRRORS CAST EPOXY
Richard J. Cavaliere and Joseph Werthwine Apr. 1975 26 p refs
(AD-A021186; FA-TR-75015) Avail: NTIS CSCL 20/6

This report is concerned with improving the techniques of making replica mirrors as reported in 'The Process and Techniques of Fabricating Replica', F.A. Report PP-T-2520-1 by Robert P. Hogan, Nov. 1967. The process involves the reproduction of a polished mirror surface, in the form of a thin film epoxy casting complete in all details, on an aluminum preform. Double replication, used in this study, is a two stage process whereby an inverse replication of a master mirror surface is cast on a submaster, and is then conversely replicated on an aluminum preform. The epoxy, after proper vacuum coating, becomes the mirror, and the aluminum provides stability, rigidity and strength. GRA

N76-28009# Aerospace Corp., El Segundo, Calif. Lab. Operations.
CARRIER DIFFUSION DEGRADATION OF CCD (CHARGE-COUPLED DEVICES) IMAGE MTF (MODULATION TRANSFER FUNCTION) FOR BROADBAND OPTICAL SOURCES
David H. Seib 29 Jan. 1976 33 p refs
(Contract F04701-75-C-0076)
(AD-A020600; SAMSO-TR-76-25; TR-0076(6930)-2) Avail: NTIS CSCL 17/8

Analytical results for the degradation of charge-coupled-imager modulation transfer function due to minority carrier diffusion effects are given for broadband optical sources. Both frontside and backside illuminated devices are considered. The effect of restricting the optical band on both broadband modulation transfer function and responsivity is considered. It is concluded that best imager performance is obtained for the full optical band (0.4-1.2 micrometers), and that backside illumination is the best approach to device fabrication from the standpoint of carrier diffusion degradation of modulation transfer function. GRA

N76-28010# Army Aeromedical Research Lab., Fort Rucker, Ala.
AVIATOR PERFORMANCE MEASUREMENT DURING LOW ALTITUDE ROTARY WING FLIGHT WITH THE AN/PVS-5 NIGHT VISION GOGGLES Final Report
Michael G. Sanders, Kent A. Kimball, Thomas L. Frezell, and Mark A. Hofmann Dec. 1975 71 p refs
(AD-A020631; USAARL-76-10) Avail: NTIS CSCL 17/8

Aviators were required to fly a UH-1 helicopter at night with and without night vision goggles (AN/PVS-5). Three types of goggles were used: 40 deg field-of-view (FOV), 60 deg FOV, and 40 deg FOV with a 30% bifocal cut. During flight, data were acquired on over twenty aircraft status and control input variables. These data, for purposes of performance comparison, were subjected to both univariate and multivariate analyses. The six subjects (instructor pilots) also responded to a questionnaire regarding preference, training and estimated capabilities of each type intensification system. The major findings of both the subjective and objective measures are provided.GRA

N76-28011# Army Electronics Command, Fort Monmouth, N.J.
AN INFRARED SENSING TECHNIQUE FOR REAL-TIME MACHINE PROCESS CONTROL Final Report
Seymour L. Hersh and Keith C. Donaldson Jan. 1976 29 p refs
(DA Proj. 1S7-62703-DH-93)
(AD-A020319; ECOM-4387) Avail: NTIS CSCL 17/5

A process control technique is described wherein a direct assessment of the camera film being processed is made using an infrared densitometer to monitor the density of a calibrated exposure on the developing film. Using a device which embodies this technique, it was demonstrated that substantial variations in developer temperature, concentration, and exhaustion could be tolerated standard-equivalent sensitometry was obtained in the presence of the developer variations described by an appropriate adjustment of development time, which was indicated by the device read-out. Author (GRA)

N76-28012# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
OPTICAL MATCHED FILTER IMAGE CORRELATOR Final Report, 1 May 1974 - 1 Mar. 1975
Alex Grumet, Paul Kaestner, Steven S. Hsiao, Kenneth G. Leib, and Robert Bondurant May 1975 139 p refs
(Contract DAAK02-74-C-0275)
(AD-A021063; RE-512) Avail: NTIS CSCL 17/8

This report describes an analytic and experimental investigation for the automatic detection, recognition, and tracking of real targets at night with a Night Observation Device (NOD) image intensifier connected to a Grumman Optical Matched Filter Image Correlator (OMFIC). A preliminary demonstration with a scaled tank model located at some distance in a parking lot was conducted at Grumman and is described. Videotaped tank and truck imagery obtained at Fort Belvoir, Virginia at night and during the day was played through the system and these results are described. The results of this study indicate that it is possible to detect, recognize, and track live targets or objects with the NOD-OMFIC system. Two areas for future investigation are discussed: (1) the limitations imposed by large optical memories and (2) improved imagery into the OMFIC. GRA

N76-28013# Naval Research Lab., Washington, D.C.
LASER DAMAGE IN 8- TO 14-MICRON MERCURY-CADMIUM-TELLURIDE PHOTOVOLTAIC DETECTOR MATERIAL
F. Bartoli, L. Esterowitz, R. Allen, and M. Kruer 20 Jan. 1976 15 p refs
(ARPA Order 2274)
(AD-A020723; NRL-7959) Avail: NTIS CSCL 17/5

A two-dimensional thermal analysis of laser-irradiated HgCdTe photovoltaic (PV) detectors is presented, and irreversible damage thresholds are determined as a function of irradiation time and beam diameter. Damage thresholds were measured experimentally for HgCdTe crystals similar in size and mounting to those used in operating photovoltaic detectors. Calculated thresholds for HgCdTe PV detectors are compared to those for HgCdTe photoconductive (PC) and PbSnTe PV detectors. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N76-28014*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY SCALING LAWS FOR PLASMA CURRENT, ION KINETIC TEMPERATURE, AND PLASMA NUMBER DENSITY IN THE NASA LEWIS BUMPY TORUS PLASMA
J. Reece Roth 1976 29 p refs Presented at the 3d Intern. Conf. on Plasma Sci., Austin, Tex., 24-26 May 1976; sponsored by IEEE
(NASA-TM-X-73434; E-8783) Avail: NTIS HC $4.00 CSCL 20I

Parametric variation of independent variables which may affect the characteristics of bumpy torus plasma have identified those which have a significant effect on the plasma current, ion kinetic temperature, and plasma number density, and those which do not. Empirical power law correlations of the plasma current, and the ion kinetic temperature and number density were obtained

as functions of potential applied to the midplane electrode rings, the background neutral gas pressure, and the magnetic field strength. Additional parameters studied included the type of gas, the polarity of the midplane electrode rings, the mode of plasma operation, and the method of measuring the plasma number density. No significant departures from the scaling laws appear to occur at the highest ion kinetic temperatures or number densities obtained to date. Author

N76-28015*# Old Dominion Univ. Research Foundation, Norfolk, Va.
X-RAY EMISSION FROM HIGH TEMPERATURE PLASMAS Annual Report, 1 Jul. 1975 - 30 Jun. 1976
Wynford L. Harries Jul. 1976 40 p refs
(Grant NsG-1022)
(NASA-CR-148313; PGS-TR-PH-76-39) Avail: NTIS HC $4.00 CSCL 20I

The physical processes occurring in plasma focus devices were studied. These devices produce dense high temperature plasmas, which emit X rays of hundreds of KeV energy and one to ten billion neutrons per pulse. The processes in the devices seem related to solar flare phenomena, and would also be of interest for controlled thermonuclear fusion applications. The high intensity, short duration bursts of X rays and neutrons could also possibly be used for pumping nuclear lasers. Author

N76-28016# Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland).
NONLINEAR EXCITATION OF ACOUSTIC WAVES IN A DOUBLE PLASMA DEVICE
E. S. Weibel and M. Q. Tran Apr. 1976 20 p refs Sponsored by Swiss NSF
(LRP-101/76) Avail: NTIS HC $3.50

In the double plasma device ion acoustic waves are generated when the potential difference between the two plasmas is varied. This perturbation affects at first only the ions since the electrons are repelled from the grid that separates the two plasmas. The analysis of the ion orbits near the grid leads to a source term in Vlasov's equation for the ion distribution function. This source and therefore the ion acoustic wave depends nonlinearly on the exciting potential. Analytic and numerical results are given. Author

N76-28017# California Univ., Livermore. Lawrence Livermore Lab.
212B VACUUM VESSEL, A UNIQUE DESIGN
S. M. Hibbs and M. O. Calderon 3 Nov. 1975 6 p refs Presented at IEEE 6th Symp. on Engr. Problems of Fusion Res., San Diego Calif., 17 Nov. 1975
(W-7405-eng-48)
(UCRL-77226; Conf-751125-29) Avail: NTIS HC $4.50

The 2XIIB mirror confinement experiment makes unique demands on its vacuum system. The confinement coil set encloses a cavity whose surface is comprised of both simple and compound curves. Within this cavity and at the core of the machine is the operating vacuum which is on the order of 10 to the 9th power Torr. The vacuum container fits inside the cavity, presenting an inside surface suitable for titanium getter pumping and a means of removing the heat load imposed by incandescent sublimator wires. In addition, the cavity is constructed of nonmagnetic and nonconducting materials (nonmetals) to avoid distortion of the pulsed confinement field. It is also isolated from mechanical shocks induced in the machine's main structure when the coils are pulsed. The design, construction, and operation are described of the 2XIIB high-vacuum vessel that has been performing successfully since early 1974. Author (ERA)

N76-28018# Addis Translations International, Portola Valley, Calif.
ONE-DIMENSIONAL NUMERICAL EXPERIMENT ON PARAMETRIC HEATING OF PLASMA, PART 1
Yu. S. Sigov and Yu. V. Khodyrev Nov. 1975 13 p refs Sponsored by ERDA
(UCRL-Trans-10981) Avail: NTIS HC $3.50

Some results of a one dimensional numerical experiment on high frequency plasma heating with an external field of frequency omega equals 1.005 omega/sub/pe/and amplitude E sub 0 root 4 pi n sub 0 T/sub e sub 0/equals 1 are presented. The excitation of an aperiodic branch of parametric instability is demonstrated. The effective collision frequency and the proportion of non-Maxwellian electrons are estimated. Author (NSA)

N76-28019# Addis Translations International, Portola Valley, Calif.
NUMERICAL MODELLING OF TWO-DIMENSIONAL LANGMUIR TURBULENCE
A. N. Polyudov, R. Z. Sagdeev, and Yu. S. Sigov Nov. 1975 44 p Sponsored by ERDA
(UCRL-Trans-10980) Avail: NTIS HC $4.00

Within the framework of two-dimensional discrete modelling of plasma in x,y-geometry the evolution of a monochromatic electrostatic wave of large amplitude has been investigated. The kinetic effects associated with the self-focussing of Langmuir oscillations are considered. Expressions are obtained for the effective collision frequency, the form of the distribution function, and spectra of strong Langmuir turbulence. Author (NSA)

N76-28020# Los Alamos Scientific Lab., N.Mex.
MULTICHANNEL SPARK-GAP TECHNOLOGY FOR STAGED THETA-PINCH MACHINES
W. H. Borkenhagen, R. F. Gribble, L. D. Hansborough, R. K. Linford, J. G. Melton, and W. C. Nunnally 1975 5 p refs Presented at the 6th Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract W-7405-eng-36)
(LA-UR-75-2152) Avail: NTIS HC $4.50

Triggered multichannel switches operating at voltages up to 180 kV with inductances of 10 to 15 nH were developed for the staged theta-pinch machines at LASL. These multichannel devices, depending upon their design, can switch up to 30 kJ per switch with peak currents up to 1 MA. The designs of the various spark-gap configurations are discussed from a mechanical and an electrical viewpoint. The switching modes including crowbar, high-voltage start, and high-voltage holdoff low-voltage start, as well as the experimentally determined triggering characteristics, are also discussed. Author (NSA)

N76-28021# Los Alamos Scientific Lab., N.Mex.
SYSTEM DESIGN OF THE LOS ALAMOS SCIENTIFIC LABORATORY'S STAGED THETA PINCH
C. F. Hammer, K. S. Thomas, W. H. Borkenhagen, R. S. Dike, J. J. Banta, R. F. Gribble, and R. K. Linford 1975 8 p refs Presented at the 6th Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract W-7405-eng-36)
(LA-UR-75-2151; Conf-751125-49) Avail: NTIS HC $4.50

The Los Alamos Scientific Laboratory's staged theta pinch (STP) is the most recent theta pinch to be constructed at Los Alamos. The intent of the experiment is to provide programmable magnetic fields so that the initial implosion heating and compression of the theta-pinch plasma can be accomplished by the use of separate capacitor banks. The STP is a 4.5-m-long linear theta pinch, the discharge tube diameter is 20 cm. The system consists of five separate and independent capacitor banks, a 75-kV preionization bank, two 125-kV pulse-forming banks, a 700-kJ, 50-kV staging bank, and a 75-kV staging crowbar bank. A description is given of the STP electrical system and the mechanical design. Some of the unique components and techniques developed so this experiment could be built are described. Author (NSA)

N76-28022# Institutul de Fizica Atomica, Bucharest (Romania).
THERMAL CONDUCTIVITY OF THE THERMONUCLEAR PLASMA DOPED WITH IMPURITIES AND THERMAL PSEUDO-CONDUCTIVITY IN THE PRESENCE OF A SPACE TRANSPORT OF PARTICLES AT A CONSTANT FLUX
G. Cristea 1975 13 p refs Sponsored by ERDA
(IFA-FR-133-1975) Avail: ERDA Depository Libraries HC $3.50

The coefficient of the heat conductivity of a thermonuclear plasma doped with impurities is deduced with the help of a simplified physical model of the thermonuclear plasma. On the basis of the same simplified physical model, a coefficient of the heat pseudo-conductivity deduced of the thermonuclear plasma within a spatial transport of particles exists in the form of a constant flow. Author (NSA)

N76-28023# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR).
SEVERAL PROBLEMS IN THEORY OF TOKAMAK MICROINSTABILITIES
D. G. Lominadze, A. B. Mikhailovskii, and W. M. Tang 1975 11 p refs Transl. into ENGLISH from the Russian report IAE-2584 Sponsored by ERDA
(ERDA-TR-106; IAE-2584) Avail: NTIS HC $3.50

Considerations are expressed as to which of the yet-unsolved problems of Tokamak microinstability theory are of interest as objects of research for the near future. Author (NSA)

N76-28024# Commissariat a l'Energie Atomique, Grenoble (France).
LOCATION OF THE LOWER HYBRID HEATING ABSORPTION ZONE IN TOROIDAL DEVICES
P. Lallia Jun. 1975 20 p refs Sponsored by ERDA
(EUR-CEA-FC-774) Avail: ERDA Depository Libraries HC $3.50

The location of the transformation of the incident electromagnetic wave into an electrostatic plasma wave near the lower hybrid resonance can be determined by using the warm plasma theory. This region corresponds roughly to the linear absorption region or to the source of non linear waves, since there the electric field is maximum. A numerical determination of this region is made for two toroidal devices: the WEGA Stellarator and the JET Tokamak. Author (NSA)

N76-28025# Princeton Univ., N.J. Plasma Physics Lab.
FUSION REACTIVITIES AND NEUTRON SOURCE CHARACTERISTICS OF BEAM-DRIVEN TOROIDAL REACTORS WITH BOTH D AND T INJECTION
D. L. Jassby and H. H. Towner Jan. 1976 60 p refs
(Contract E(11-1)-3073)
(MATT-1180) Avail: NTIS HC $5.45

The reactor performance is considered for intensely beam-driven Tokamak plasmas with 50:50 D-T composition maintained by neutral-beam injection of both D and T, together with plasma recycling. The D and T are injected with equal intensity and velocity. This mode of operation is most appropriate for high-duty-factor, high-power-density operation, in the absence of pellet injection. The isotropic velocity distributions of energetic D and T ions (for multi-angle injection) are calculated from a simple slowing-down model, but include a tail above the injection velocity. The neutron source characteristics are determined from fusion reactivities calculated for beam-target, hot-ion, and thermonuclear reactions. For conditions where Q approximates 1, beam-target reactions are dominant, although reactions among the hot ions contribute substantially to P/sub fusion/ when n/sub hot//n/sub e/greater than or equal to 0.2. Author (NSA)

N76-28026# Princeton Univ., N.J. Plasma Physics Lab.
THE 200 kW, 800 MHz TRANSMITTER SYSTEM FOR LOWER HYBRID HEATING
A. Deitz 1975 16 p Presented at the IEEE 6th Symp. on Eng. Probl. of Fusion Res., San Diego
(Contract E(11-1)-3073)
(CONF-751125-130) Avail: NTIS HC $3.50

A RF heating system is described which has just been completed and is now operational on the ATC machine. The system utilizes four UHF TV klystrons to generate at least 200 kW of power at a frequency of 800 MHz. Pulse widths can be varied from 20 mu sec up to 20 msec. A radar type floating deck modulator along with photo-optical transmitting and receiving devices were incorporated into the system to provide the pulse fidelity and versatility which characterizes this equipment. Modular construction was emphasized in the design, when possible, to reduce maintenance and down time in the advent of component failure. Hybrid combining techniques are utilized in order to provide two 100 kW feeds into the machine.
Author (NSA)

N76-28027# Princeton Univ., N.J. Plasma Physics Lab.
RADIO FREQUENCY PLASMA HEATING IN LARGE TOKAMAK SYSTEMS NEAR THE LOWER HYBRID RESONANCE
A. Deitz and W. M. Hooke 1975 12 p Presented at the IEEE 6th Symp. on Eng. Probl. of Fusion Res., San Diego
(Contract E(11-1)-3073)
(CONF-751125-129) Avail: NTIS HC $3.50

The frequency range, power, efficiency, and pulse length of a high power RF system are discussed as they might be applied to the TFTR Tokamak facility as well as on a full scale reactor. Comparisons are made of the size, power output, and costs to obtain microwave power sufficient to satisfy the physics requirements. A microwave feed concept is discussed which will improve the coupling of the microwave energy into the plasma. The unique advantages of waveguide feed systems is apparent when one considers the practical problems associated with coupling supplementary heating energy into a reactor.
Author (NSA)

N76-28028# Princeton Univ., N.J. Plasma Physics Lab.
TRANSFORMATION OF THE SINGLE ENERGY GROUP TRANSPORT, EQUATION TO AXISYMMETRIC TOROIDAL COORDINATES
S. L. Gralnick 1975 4 p refs Presented at the IEEE 6th Symp. on Eng. Probl. of Fusion Res., San Diego
(Contract E(11-1)-3073)
(CONF-751125-103) Avail: NTIS HC $4.00

The streaming term of the single energy group transport equation was derived for a general class of axisymmetric toroidal geometries using a tensor transformation formalism. The particular case of nested circular toroids treated previously by Pomraning and Stevens may be obtained by direct substitution into the equation. Other, more complicated geometries of interest to plasma physics and fusion reactor research are obtainable in the same manner. The cylindrical limit in which the azimuthal curvature is neglected may be obtained by taking the ratio of the poloidal curvature to X sup 1, the toroidal curvature, to zero. Similarly the planar limit results when both curvatures are small compared to the inverse of the physical dimension measured normal to the toroidal surface. Author (NSA)

N76-28029# Princeton Univ., N.J. Palmer Physical Lab.
GENERAL PLASMA PHYSICS 1, FALL SEMESTER 1973
H. P. Furth and P. H. Rutherford 1973 237 p refs
(Contract AT(11-1)-3073)
(TID-26913) Avail: NTIS HC $9.00

A total of 34 lectures on various aspects of plasma physics is given. The lectures cover collisions, orbit theory, particle confinement in a torus, fluid properties of plasma, atomic processes, the Vlasov equation, transport equations, plasma diffusion, plasma waves, and Landau damping. NSA

N76-28030# Energy Research and Development Administration, Washington, D.C.
SYMBOLIC COMPUTATION IN CONTROLLED THERMONUCLEAR RESEARCH
Mar. 1974 14 p
(ERDA-115) Avail: NTIS HC $4.00

A listing is given of the types of problems which have already been solved by symbolic computation, as well as a discussion of the various software systems which have been used. A detailed discussion is given of areas of CTR research where symbolic computation is of potential usefulness. Attempts to estimate the potential usage of symbolic computation by the CTR community are outlined. The detailed recommendations of the panel are given. Author (NSA)

N76-28031# Princeton Univ., N.J. Plasma Physics Lab.
DATA ACQUISITION FOR PLT
P. A. Thompson 1975 40 p refs Presented at the IEEE 6th Symp. on Eng. Probl. of Fusion Res., San Diego
(Contract E(11-1)-3073)
(CONF-751125-118) Avail: NTIS HC $4.00

The data acquisition system for the Princeton Large Torus (PLT) fusion research device, consists of a PDP-10 host computer, five satellite PDP-11s connected to the host by a special high-speed interface, miscellaneous other minicomputers and commercially supplied instruments, and much PPPL produced hardware. The software consists of the standard PDP-10 monitor with local modifications and the special systems and applications programs to customize the DA/PLT for the specific job of supporting data acquisition, analysis, display, and archiving, with concurrent off-line analysis, program development, and, in the

background, general batch and timesharing. Some details of the over-all architecture are presented, along with a status report of the different PLT experiments being supported. Author (NSA)

N76-28032# California Univ., Livermore. Lawrence Livermore Lab.
COLD COMPONENT FLOW IN A TWO-COMPONENT MIRROR MACHINE
T. D. Rognlien Dec. 1975 35 p refs
(Contract W-7405-eng-48)
(UCID-16962) Avail: NTIS HC $4.00

Steady-state solutions are given for the flow characteristics along the magnetic field of the cold plasma component in a two-component mirror machine. The hot plasma component is represented by a fixed density profile. The fluid equations are used to describe the cold plasma, which is assumed to be generated in a localized region at one end of the machine. The ion flow speed, v/sub i/, is required to satisfy the Bohm sheath condition at the end walls, i.e., v/sub i/ greater than or equal to c/sub s/, where c/sub s/ is the ion-acoustic speed. For the case when the cold plasma density, n/sub c/, is much less than the hot plasma density, n/sub h/, the cold plasma is stagnant and does not penetrate through the machine in the zero temperature case. The effect of a finite temperature is to allow for the penetration of a small amount of cold plasma through the machine. For the density range n/sub c/ approximately n/sub h/, the flow solutions are asymmetric about the midplane and have v/sub i/ equals c/sub s/ near the midplane. Finally, for n/sub c/ much greater than n/sub h/, the solutions become symmetric about the midplane and approach the Lee-McNamara type solutions with v/sub i/ equals c/sub s/ near the mirror throats. Author (NSA)

N76-28033# Brookhaven National Lab., Upton, N.Y.
INTENSE NEGATIVE HYDROGEN ION SOURCE FOR NEUTRAL INJECTION INTO TOKAMAKS
K. Prelec and T. Sluyters 1975 5 p refs Presented at the Sixth Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(BNL-20656; Conf-751125-87) Avail: NTIS HC $4.50

In this scheme negative ions are extracted from a plasma source, accelerated to the required energy, and then neutralized by stripping in a gas, metal vapor, or plasma jet. One of the most promising direct extraction sources is the magnetron source, operating in the mixed hydrogen-cesium mode. In the present source cathode current densities are up to 20 A/sq cm at arc voltages between 100 V and 150 V. In order to utilize the discharge more efficiently multislit extraction geometry was adopted. Highest currents were obtained by using six slits, with a total extraction area of 1.35 sq cm. At an extraction voltage of 18 kV negative hydrogen ion currents close to 1 A were obtained, which corresponds to current densities of about 0.7 A/sq cm at the extraction aperture. Pulse length was 10-20 ms and the repetition rate 0.1 Hz. The total extracted current was usually 2-3 times the H(-) current. Author (NSA)

N76-28034# Rensselaer Polytechnic Inst., Troy, N.Y.
SPACE AND TIME RESOLVED MEASUREMENTS IN MAGNETICALLY CONFINED PLASMAS USING A HEAVY ION BEAM PROBE
W. C. Jennings and R. L. Hickok 1975 4 p Presented at the 22d Intern. Conf. on Phenomena in Ionized Gases, Eindhoven, Netherlands, 18 Aug. 1975 Sponsored by ERDA
(COO-2229-10; Conf-750871-1) Avail: NTIS HC $4.50

A heavy ion beam probe provides space and time resolved measurements of plasma density, space potential, electron temperature, and current density in energetic, magnetically confined plasmas. A new dual beam technique has been developed to separate density and electron temperature measurements by probing the plasma with two different species. An extension of this technique has been used in conjunction with a feedback controlled, electrostatic energy analyzer to yield the only direct, absolute measurement of plasma space potential. Calibration of the frequency response of the analyzer/detector system has permitted direct measurements of the amplitude and phase of both density and space potential oscillations associated with plasma instabilities. Author (NSA)

N76-28035# Sydney Univ. (Australia). School of Physics.
PLASMA-SCANNED MICHELSON INTERFEROMETRY
D. V. Bartlett, R. G. Hewitt, G. D. Tait, and L. C. Robinson Sep. 1975 10 p refs Sponsored by ERDA
(ER-90) Avail: ERDA Depository Libraries HC $4.25

The plasma-scanned far-infrared Michelson interferometer is described. The use of this device to measure electron densities in hydrogen discharge plasma is discussed. ERA

N76-28036# Oak Ridge National Lab., Tenn.
PROPOSED SPATIAL ION TEMPERATURE MEASUREMENT WITH A FIR LASER
D. P. Hutchinson and K. L. VanderSluis Nov. 1975 28 p refs
(Contract W-7405-eng-26)
(ORNL-TM-5071) Avail: NTIS HC $4.00

A feasibility study for measuring the ion temperature in a thermonuclear type plasma by ion Thomson scattering is presented. The study indicates that the measurement is possible with predictable improvements in FIR laser power and FIR detector development. The possibility of measuring the effective charge anti Z of a plasma using the same techniques is discussed. Author (ERA)

N76-28037# Argonne National Lab., Ill.
EXPERIMENTAL STUDIES OF TRITIUM BARRIER CONCEPTS FOR FUSION REACTORS
V. A. Maroni, E. H. VanDeventer, T. A. Renner, R. H. Pelto, and C. J. Wierdak 1975 34 p refs Presented at Intern. Conf. on Radiation Effects and Tritium Technol. for Fusion Reactors, Gatlinburg, Tenn., 1-3 Oct. 1975
(Contract W-31-109-eng-38)
(CONF-750989-1) Avail: NTIS HC $5.00

Ongoing experimental studies at ANL aimed at the development of methods to reduce tritium migration in fusion reactor systems currently include work on the development of multilayered metal composites and impurity-coated refractory metals as barriers to tritium permeation in elevated temperature (greater than 300 C) structures and investigations of the kinetics of tritium trapping reactions in inert gas purge streams under conditions that emulate fusion reactor environments. Significant results obtained thus far are demonstration of greater than 50-fold reductions in the hydrogen permeability of stainless steel structures by using stainless steel-clad composites containing an intermediate laver of a selected copper alloy and verification that surface-oxide coatings lead to greater than 100-fold reductions in the hydrogen permeability of vanadium, but that severe oxygen penetration and embrittlement of the vanadium occur at temperatures in the range from 300 to 800 C and under conditions of extremely low oxygen potential. Author (NSA)

N76-28038# Mound Lab., Miamisburg, Ohio.
EVALUATION STUDY OF THE TRITIUM-HANDLING REQUIREMENTS OF A TOKAMAK EXPERIMENTAL POWER REACTOR
L. J. Wittenberg, J. C. Bixel, J. D. Braun, D. L. Hobrock, C. J. Kershner, J. C. Miles, T. B. Rhinehammer, R. A. Watkins, and W. R. Wilkes Nov. 1975 32 p refs
(Contract E-33-1-GEN-53)
(MLM-2259) Avail: NTIS HC $4.00

The tritium handling and containment technology common to all Tokamak Experimental Power Reactor (EPR) conceptual designs is evaluated. The EPR is assumed to be fueled with a 50/50 deuterium-tritium mixture and to produce thermal power in the 150 to 450 MW range with mechanical power achieved by a steam turbine. The structure will be fabricated principally with stainless steel and no tritium breeding is anticipated during the initial operation. The necessary plant systems and associated administrative control requirements that are discussed include the plasma fuel and exhaust systems, the blanket and coolant system, the plant containment system, tritium accountability, and construction and operation of the reactor facility. Author

N76-28039# Oak Ridge National Lab., Tenn.
PLASMA CRITERIA FOR A LOW-IMPURITY, CIRCULAR TOKAMAK
J. T. Hogan Feb. 1975 50 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4772) Avail: NTIS HC $5.50

The development of criteria for plasma transport and injection scaling requirements of power producing systems is summarized to establish optimal parameters for a Tokamak device. The key technological elements are superconducting magnets and high current neutral beams. The physics questions were centered around the handling of large energy fluxes in a way which minimizes impurity production in experiments with pulse times much longer than an energy confinement time. Requirements relevant to questions of impurity control and injection scaling are examined. Author (NSA)

N76-28040# Princeton Univ., N.J. Plasma Physics Lab.
MHD EQUILIBRIUM PROPERTIES OF TOKAMAK FUSION REACTOR DESIGNS
A. M. M. Todd, S. L. Gralnick, and H. E. Dalhed Jan. 1976 25 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 18-21 Nov. 1975
(Contract E(11-1)-3073)
(MATT-1199; Conf-751125-119) Avail: NTIS HC $3.50

The equilibrium properties of several Tokamak Reactor Designs were analyzed and compared for varying pressure and current profiles using the Princeton Equilibrium Code. It is found that the UWMAK configuration has a broader range of equilibria than the Princeton Reference Design configuration, but that the safety factor on axis is less than unity for peaked current distributions. The Argonne Experimental Power Reactor has a satisfactory range of equilibria, but a means of limiting or diverting the plasma has not yet been proposed, and this may substantially change the results obtained. Author (NSA)

N76-28041# Princeton Univ., N.J. Plasma Physics Lab.
SOME EFFECTS OF PARALLEL ENERGY PROPAGATION ON THE STRUCTURE OF DISSIPATIVE TRAPPED ELECTRON MODES
N. R. Sauthoff Jan. 1976 10 p refs
(Contract E(11-1)-3073)
(MATT-1200) Avail: NTIS HC $3.50

The limitation of ballooning by parallel energy propagation is investigated for the dissipative trapped electron mode, wherein the local energy influx is proportional to the poloidally dependent trapped particle fraction. For small energetic asymmetries [mg less than 2.5 (OMEGS/sub i/a/c/sub s/) (mg less than 2.5(OMEGA/sub i/a/c/sub s/) (a/R/sup3/4)] the structure along the field line is predominantly a phase shift, dictated by the condition that the asymmetric energy input be compensated by parallel energy flow. For large asymmetry, mode number, and parallel arc length, the phase and amplitude variations necessitate an integral equation treatment. Author (NSA)

N76-28042# Princeton Univ., N.J. Plasma Physics Lab.
MAXIMUM NEUTRON WALL LOADINGS IN BEAM-DRIVEN TOKAMAK REACTORS
D. L. Jassby Jan. 1976 13 p refs
(Contract E(11-1)-3073)
(MATT-1192) Avail: NTIS HC $4.00

If a beam-driven D-T Tokamak reactor is operated at the maximum density allowed both by pressure limitation and by adequate neutral-beam penetration, the 14-MeV neutron wall loading increases approximately linearly with magnetic field or vertical elongation of the plasma. With elongation equals 3, B/sub tmax/ equals 15 T, W/sub beam/ equals 200 keV, Q approximately 1.0, maximum wall loading is about 5 MW/sq. Author NSA

N76-28043# Princeton Univ., N.J.
PULSED GAS LOAD PUMPING OF HYDROGEN BY VAPOR DEPOSITED TITANIUM FILMS
G. D. Martin Jan. 1976 30 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract E(11-1)-3073)
(MATT-1193; Conf-751125-135) Avail: NTIS HC $4.00

The Princeton Poloidal Divertor Experiment (PDX) plans to use titanium gettering of hydrogen to provide the high pumping speeds required to capture the pulsed gas load which occurs in the region where the diverted plasma is neutralized. Pumping speeds for hydrogen on titanium films were determined by admitting a pulse of gas into the volume enclosed by the substrate and measuring the time constant of the pressure decay. The measurement was made periodically as the film was deposited, and when the maximum sticking coefficient was reached, sublimation was stopped and additional gas pulses admitted to determine the speed vs. hydrogen concentration in the Ti film. The amount of gas per pulse varied from 0.25 to 5 monolayers. Atomic hydrogen produced by thermal dissociation in a continuous measurement gave minimum-values for the sticking coefficient of 0.3 for a room temperature film. Author (NSA)

N76-28044# Princeton Univ., N.J. Plasma Physics Lab.
ANALYTIC SOLUTIONS FOR CONSTANT TENSION COIL SHAPES
S. L. Gralnick and F. H. Tenney Jan. 1976 30 p refs
(Contract E(11-1)-3073)
(MATT-1197) Avail: NTIS HC $4.00

An analytical solution of the differential equation describing the shape of a flexible filamentary conductor (incapable of supporting bending stresses) in a toroidal magnetic field was obtained. The solution derives from a series expansion of modified Bessel functions of integer order. The characteristics of toroidal field magnets for proposed Tokamak devices are obtainable by term by term integration of the solution series. General expressions are given for the following coil characteristics: the conductor turn length, the solenoid inductance, the area enclosed by the coil and the coil support dimensions. For several particular cases of interest these coil characteristics are obtained as closed form analytical formula. Author (NSA)

N76-28045# Princeton Univ., N.J. Plasma Physics Lab.
HIGH POWER MODULATOR/REGULATORS FOR NEUTRAL BEAM SOURCES
J. Q. Lawson and A. Deitz 1975 10 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract E(11-1)-3073)
(CONF-751125-131) Avail: NTIS HC $3.50

PPPL has recently completed two new Modulator/Regulators for neutral injection sources used on the ATC machine and is constructing four new ones for use with sources on the PLT machine. The ATC modulator uses the well proven 4CX35,000C tetrode as the main switch tube, while the PLT modulators will be using the new but significantly higher powered X-2170 tetrodes. Some interesting circuit and manufacturing techniques are discussed. ERA

N76-28046# Princeton Univ., N.J. Plasma Physics Lab.
ENERGY SYSTEM FOR THE GENERATION OF DIVERTOR MAGNETIC FIELDS IN THE PDX FUSION RESEARCH DEVICE
N. M. Turitzin 1975 6 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Deigo, Calif., 17 Nov. 1975
(Contract E(11-1)-3073)
(CONF-751125-125) Avail: NTIS HC $3.50

One of the major problems encountered in the development of Tokamak type fusion reactors is the presence of impurities in the plasma. The PDX device is designed to study the operation of poloidal magnetic field divertors and consequent magnetic limiters for controlling and reducing the amount of impurities. A system of coils placed at specific locations produces a required field configuration for the poloidal divertor. The system of energy supplies required and the interrelations of field coil currents during plasma current initiation, growth and steady state is described. Author (NSA)

N76-28047# Princeton Univ., N.J. Plasma Physics Lab.
PROPOSED TFTR ELECTRICAL SYSTEM
G. Bronner and J. Murray 1975 13 p Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(CONF-751125-91) Avail: NTIS HC $3.50

The development of controlled thermonuclear fusion has progressed to the stage where the present facilities and energy available for future devices are not sufficient and must be increased by about a factor of ten. This report describes the proposed TFTR ac utility power distribution system, an energy storage motor generator flywheel facility, and the rectifier conversion

equipment for the Toroidal Field Confining System (TF), Ohmic Heating System (OH), Equilibrium Field System (EF) and the Neutral Beam Heating System (NB). The general requirements are described and the special design considerations identified.
Author (NSA)

N76-28048# Princeton Univ., N.J. Plasma Physics Lab.
FABRICATION OF THE PDX VACUUM VESSEL
J. B. Joyce and D. H. Mullaney 1975 4 p Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975
(Contract E(11-1)-3073)
(CONF-751125-90) Avail: NTIS HC $3.50

The vacuum vessel for PDX is designed to meet the three goals of large volume, simplicity and accessibility. A shell of one half inch thick welded 305 stainless steel meets these requirements. The geometry of the tank is that of a stretched torus having a cross sectional shape of a race track. Access to the inside of the tank is available through man sized ports, removal of top or bottom, or separation of the vessel into halves by a joint in the vertical plane. Evacuation is accomplished by either mercury diffusion pumps, backed by rotary mechanical pumps, or liquid helium cryopumping in conjunction with turbomolecular pumps. Both systems are being evaluated.
Author (NSA)

N76-28049# Princeton Univ., N.J. Plasma Physics Lab.
CONCEPTUAL DESIGN OF A DIVERTOR FOR A TOKAMAK EXPERIMENTAL POWER REACTOR
A. V. Georgievsky, S. L. Gralnick, D. L. Jassby, D. M. Meade, L. G. Saksagansky, and F. H. Tenney 1975 7 p refs Presented at the 6th IEEE Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(CONF-751125-105) Avail: NTIS HC $3.50

A design for a Double Null Poloidal Divertor for a Tokamak Experimental Power Reactor (EPR) is presented which allows remote assembly of the torus and utilizes a standard neutral pumping and heat removal system. Author (NSA)

N76-28050# Oak Ridge National Lab., Tenn.
SCOPING STUDIES OF TRITIUM HANDLING IN A TOKAMAK EXPERIMENTAL POWER REACTOR
J. S. Watson, R. Cherdack, S. D. Clinton, and P. W. Fisher Jan. 1976 50 p refs
(Contract W-7405-eng-26)
(ORNL-TM-5080) Avail: NTIS HC $5.50

Tritium handling techniques in an experimental fusion power reactor (EPR) are evaluated to determine the requirements of the system and to compare different equipment and techniques for meeting those requirements. Tritium process equipment is needed (1) to evacuate and maintain a vacuum in the plasma vessel and the neutral beam injectors, (2) to purify and recycle tritium and deuterium for the plasma fuel cycle, (3) to recover tritium from experimental breeding modules, and (4) to provide tritium containment and atmospheric cleanup. A development program is outlined to develop and demonstrate the required techniques and equipment and to permit confident design of an EPR for operation by the mid-1980s. Author (NSA)

N76-28051# Mound Lab., Miamisburg, Ohio.
TRITIUM INTERACTIONS OF POTENTIAL IMPORTANCE TO FUSION REACTOR SYSTEMS: TECHNOLOGY REQUIREMENTS
15 Jan. 1976 18 p refs
(Contract E(33-1)-GEN-53)
(MLM-2292) Avail: NTIS HC $4.00

The tritium technology requirements created by the controlled thermonuclear research program to develop a demonstration fusion power reactor by the year 2000 are reviewed. It is found that the majority of the technological advances which are needed to ensure adequate tritium containment in a tritium breeding power reactor need to be demonstrated on a pilot scale by approximately 1983, so that they may be incorporated into EPR-II, the second of two planned experimental power reactors. The most important advances include development of containment materials with permeabilities to tritium well below measured values for stainless steel; large scale, low inventory deuterium-tritium separation systems; and improved monitoring and assay systems. There are less critical requirements for information about the effects of tritium and helium on the mechanical properties of materials, the effects of tritium on biological systems, and data on physical and chemical properties of tritium.
Author (NSA)

N76-28052# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
[PLASMA PHYSICS RESEARCH] Annual Report, 1974
1974 141 p refs In GERMAN
(NP-20590) Avail: ERDA Depository Libraries HC $10.25

The following topics were studied: (1) high-beta plasma, (2) low-beta plasma, (3) Tokamaks, (4) laser fusion and wave heating, (5) plasma-wall interactions, (6) computer related research, (7) relativistic plasma-electron ring accelerator experiment, and (8) fusion technology. NSA

N76-28053# Brookhaven National Lab., Upton, N.Y.
SUMMARY OF EXISTING SUPERCONDUCTING MAGNET EXPERIENCE AND ITS RELEVANCE TO THE SAFETY OF FUSION MAGNET
S. Y. Hsieh, J. Allinger, G. Danby, J. Keane, J. R. Powell, and A. Prodell 1975 6 p refs Presented at the 6th IEEE Symp. of Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(BNL-20752; Conf-751125-132) Avail: NTIS HC $3.50

A comprehensive summary of experience with over twenty superconducting magnet systems was collected through visits to and discussions about existing facilities including, for example, the bubble chamber magnets at Brookhaven National Laboratory, Argonne National Laboratory and Fermi National Accelerator Laboratory, and the large superconducting spectrometer at Stanford Linear Accelerator Center. Data are summarized relating to parameters of these magnets, magnet protection methods, and operating experiences. The information is organized and presented in the context of its relevance to the safe operation of future, very large superconducting magnet systems for fusion power plants. Author (NSA)

N76-28054# Brookhaven National Lab., Upton, N.Y.
STRUCTURAL SAFETY FEATURES FOR SUPERCONDUCTING MAGNETS
J. Lehner, M. Reich, J. R. Powell, P. Bezler, D. Gardner, W. Yu, and T. Y. Chang 1975 19 p refs Presented at the 6th IEEE Symp. on Eng. Probl. of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(BNL-20726; Conf-751125-133) Avail: NTIS HC $3.50

A survey was carried out for various potential structural safety problems of superconducting fusion magnets. These areas include: (1) stresses due to inhomogeneous temperature distributions in magnets where normal regions have been initiated; (2) stress distributions and yield forces due to cracks and failed regions; (3) superconducting magnet response due to seismic excitation. These analyses were carried out using a variety of large capacity finite element computer codes that allow for the evaluation of stresses in elastic or elastic-plastic zones and around singularities in the magnet structure. Thus far, these analyses were carried out on UWMAK-I type magnet systems.
Author (NSA)

N76-28055# Brookhaven National Lab., Upton, N.Y.
LOW ACTIVITY BLANKETS FOR EXPERIMENTAL POWER REACTORS
R. Benenati, J. Fillo, O. W. Lazareth, S. Majeski, J. R. Powell, and P. Tichler 1975 20 p refs Presented at the IEEE 6th Symp. on Eng. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(BNL-20717; Conf-751125-134) Avail: NTIS HC $3.50

Low activity blankets for Tokamak experimental power reactors are presented. First wall loadings in the range of 0.5 to 1.0 MW(th)/sq m have been assumed. Blanket designs were developed for both circular plasma reactors and non-circular plasma reactors. For each of these two reactor choices, two blanket options are described. In the first option, the blanket is thick graphite block structure with coolant tubes carrying helium imbedded deep within the graphite to minimize radiation damage. In the second blanket option, the blanket is composed of aluminum

modules. The aluminum shell is maintained at a low temperature by a water coolant stream. Author (NSA)

N76-28056# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
EDDY CURRENTS IN THE ALCATOR TOKAMAK
D. C. Schram (Tech. Univ., Eindhoven, Neth.) and J. Rem Mar. 1975 49 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO), and EURATOM and Neth. Found. for Chem. Res.
(Rept-75-88) Avail: NTIS HC $4.00

A one-dimensional model of an aircore transformer was developed through which it is possible to analyze the effect of eddy currents in the primary windings, and of similar currents in the field coils for the toroidal magnetic field, on the time dependence of the current in a Tokamak experiment. The model was applied to the Alcator Tokamak and its accuracy was tested by comparing analytical results for the harmonic behavior of the transformer, with experimental data. The time-dependent behavior of the plasma current, for a constant plasma resistance, shows that eddy currents in the primary windings will lead to a reduction of 8% of the current maximum. The eddy currents in the Bitter coils are found to affect predominantly the initial current rise, they lead to a steepening of the current rise. Finally, the influence of the time dependence of the plasma resistance was investigated. Author (ESA)

N76-28057# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
HIGH-FREQUENCY RADIATION FROM STRONG DENSITY FLUCTUATIONS IN A TURBULENT PLASMA
W. R. Rutgers Dec. 1975 12 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO), and EURATOM
(Rept-75-92) Avail: NTIS HC $3.50

The electromagnetic emission spectrum emitted by a hot H2 plasma during the last few hundreds of nanoseconds when the ion temperature approaches the electron temperature was investigated in order to yield information on nonthermal fluctuations in a turbulent heating experiment. Its frequency spectrum contains frequencies below the electron plasma frequency f sub pe during the first half microsecond when plasma turbulence is characterized by streaming instabilities. When after a few microseconds the ion temperature approaches the electron temperature, a current stagnation is observed. Then the spectrum consists of clear maxima at the plasma frequency and its harmonics up to 6 f sub pe. It is demonstrated that radiation can result from strongly anharmonic electron oscillations trapped in long-lived solitary density depressions. Above 5 f sub pe enhanced bremsstrahlung must be taken into account.
Author (ESA)

N76-28058# Naval Research Lab., Washington, D.C.
INTERACTION OF CYLINDRICALLY-SYMMETRIC RELATIVISTIC ELECTRON BEAMS WITH PLANAR TARGETS AND PLASMAS, THEORY AND APPLICATIONS. Interim Report
D. Mosher Jan. 1976 36 p
(DNA Proj. NWET-T99OAXLA014)
(AD-A020930; NRL-MR-3193) Avail: NTIS CSCL 20/9

A diffusion theory for the collisional interaction of relativistic electron beams with high-atomic-number plasmas is used to develop analytical expressions for the beam-momentum distribution function in a slab target or plasma for the case of a normally incident, well-collimated, monoenergetic beam with any radial profile. Moments of the distribution function are calculated for a Gaussian incident profile of arbitrary width. Using these, contour plots of energy deposition and current flow are determined. Bremsstrahlung intensity profiles corresponding to pinhole photographs of tightly pinched beams are presented for various ratios of incident beam width to electron range. Theoretical deposition profiles, current transmission, and energy coupling of beam to target are compared with the results of Monte Carlo calculations. GRA

N76-28059# Naval Research Lab., Washington, D.C.
FUNCTIONAL EQUATION IN THE PLASMA INVERSE PROBLEM AND SOLUTIONS Interim Report
H. H. Szu, C. C. Yang, S. Ahn, and C. E. Carroll 31 Dec. 1975 49 p refs
(NRL Proj. B01-11; RR0140241)
(AD-A021059; NRL-7946) Avail: NTIS CSCL 20/9

The one-dimensional problem of determining the density distribution of a plasma from its reflection of electromagnetic waves can be solved by the Gelfand-Levitan technique. An extension and simplification of this technique has been proposed, and methods of solving the resulting functional equation were evaluated. The mathematical properties of the reflection coefficient were considered, related to the density distribution. GRA

N76-28060# Naval Research Lab., Washington, D.C.
IMPLODING LINER FUSION SYSTEMS IN CUSP-ENDED THETA PINCH GEOMETRY Interim Report
Peter J. Turchi Aug. 1975 43 p refs
(NRL Proj. RR011-09; NRL Proj. H02-28D; RR0110941)
(AD-A014509; NRL-MR-3094) Avail: NTIS CSCL 20/9

Imploding liner flux compression techniques are used to create and confine fusion plasmas at megagauss magnetic field levels, thereby allowing compact fusion systems of modest energy. The basic problem is to combine the methods of imploding liner flux compression with plasma configurations of suitable stability and simplicity. An analysis is presented of imploding liner fusion systems based on a cusp-ended theta pinch geometry and basic scaling relationships are obtained. Results indicate that reactors operating with a ten percent circulating power ratio are possible with system lengths of only thirty meters and liner kinetic energies of less than six gigajoules. Concept feasibility could be demonstrated with nine meter long systems, involving kinetic energies of less than 320 MJ. Author (GRA)

N76-28061# California Univ., Livermore. Lawrence Livermore Lab.
INTERACTION OF RELATIVISTIC ELECTRON BEAMS WITH HIGH Z PLASMAS
D. S. Kershaw 27 Oct. 1975 14 p refs Presented at Am. Phys. Soc. Conf., St. Petersburg, Fla., 10-14 Nov. 1975 Sponsored by ERDA
(UCRL-77047; Conf-751130-11) Avail: NTIS HC $4.50

A set of relativistic multigroup diffusion equations was derived for the study of electron beam-target interactions. Included are transport, Coulomb collisions, electric and magnetic fields, bremsstrahlung, and hydrodynamic motion of the background plasma. LASNEX, the Laser-Fusion code, is being modified to include these equations and will be used for modeling electron beam fusion. Author (ERA)

N76-28062# Avco-Everett Research Lab., Everett, Mass.
PLASMA MOMENTUM COUPLING Final Report, 1 May 1974 - 1 May 1975
T. L. Cronburg and D. A. Reilly May 1975 74 p refs
(Contract DNA001-74-C-0261; DNA Proj. NWET-L25BAXHX687)
(AD-A020971; DNA-3692F) Avail: NTIS CSCL 20/9

Momentum transfer between a high velocity aluminum plasma (2 x 10 to the 7th power cm/sec) and a stationary magnetized air plasma is experimentally investigated to determine if any collisionless processes are operating at high Alfven Mach number. The aluminum plasma expands within a cone (1/20 steradium) into the large volume of air plasma with the variable applied magnetic field transverse to the flow velocity. The plasma streaming is highly collisionless with a small amount of collisional momentum transfer to the background air corresponding to an average collisional cross section for aluminum on air of 2 x 10 to the minus 17th power sq cm for a velocity of 2 x 10 to the 7th power cm/sec. No enhancement above collisional values is observed for Alfven Mach numbers ranging between 12 and 200. GRA

N76-28063# Systems Research Labs., Inc., Dayton, Ohio.
KIVA-1 EXTENDED DURATION MHD GENERATOR DEVELOPMENT Final Report, 1 Feb. 1973 - 15 Mar. 1975
R. V. Shanklin, III, J. K. Lytle, R. A. Nimmo, L. W. Buechler, and H. W. Hehn Jun. 1975 278 p refs
(Contract F33615-73-C-2067)
(AD-A020590; AFAPL-TR-75-27) Avail: NTIS CSCL 10/2

An extended duration magnetohydrodynamic (MHD) generator system was developed. This system consists of the MHD combustor, nozzle, generator channel, diffuser, high speed data

acquisition system and high voltage converter. Two steady-state generator channels were designed: a pegwall channel and a diagonal conducting wall channel. The pegwall channel was only constructed in a shortened version of the generator channel and was not tested for power output. The diagonal conducting wall generator was tested for several minutes of power generation both in steady-state and pulse mode. The channel appeared unaffected by the duration or type of testing conducted. A high speed data acquisition system was incorporated into the KIVA-I test facility. This system features a PDP-8/M system controller, two DEC magnetic tape units and a CRT display. This system samples data continuously at a 16.7 KHz rate and permits rapid recovery and evaluation of test data. GRA

N76-28064# Joint Publications Research Service, Arlington, Va.
RESEARCH AND DEVELOPMENT OF HIGH-TEMPERATURE MATERIALS FOR MHD INSTALLATION ASSEMBLIES
A. I. Rekov, F. A. Akopov, E. G. Spiridonov, A. I. Romanov, and D. A. Vysotskiy 13 Jul. 1976 34 p refs Transl. into ENGLISH of "Razrabotka i Issledovanie Vysokotemperaturnykh Materialov dlya Razlichnykh uzlov mgd Ustanovok" Moscow, Inst. of High Temp. of the USSR Acad. of Sci., 1975 p 1-26
(JPRS-67586) Avail: NTIS HC $4.00

Ceramic and cermet electrodes for use in MHD generators are described. High-temperature refractory concretes for MHD assemblies are also described. Author

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N76-28065 Tennessee Univ., Knoxville.
INELASTIC INTERACTIONS OF SWIFT ELECTRONS IN SOLIDS Ph.D. Thesis
Chuan-Jong Tung 1975 134 p
Avail: Univ. Microfilms Order No. 76-11090

Theoretical calculations of electron mean free paths and electron slowing-down spectra in solids are described. These calculations involve (1) the use of an electron gas model to approximate the response of conduction band electrons in metals, (2) the application of a statistical model for the calculation of electron mean free paths in metals, (3) the development of an insulator model to describe valence band electrons in insulators and semiconductors, and (4) the use of data on atomic generalized oscillator strengths to describe the excitation of the ion cores. Exchange effects are included in the calculations through a semi-empirical procedure. Detailed results are presented for electron mean free paths in Ag, Au, Al, and Al2O3, and on the stopping power of Al and Al2O3, for electrons with energies at a few eV to 10 keV. A detailed description of the calculation of electron slowing-down spectra in solids is presented.
Dissert. Abstr.

N76-28066 Adelphi Univ., Garden City, N.Y.
X-RAY MEASUREMENT OF AN ULTRASONIC WAVE AMPLITUDE IN A CRYSTAL Ph.D. Thesis
Kenneth Joseph Lazara 1976 62 p
Avail: Univ. Microfilms Order No. 76-14038

The effect of an ultrasonic wave on the integrated intensity in the Borrmann effect is used to calculate the ultrasonic wave amplitude in a silicon crystal. The amplitude of the ultrasonic wave as a function of the voltage applied to the transducer was investigated. Dissert. Abstr.

N76-28067 Stanford Univ., Calif.
THEORY OF A CONDENSED CHARGED-BOSE, CHARGED FERMI GAS AND GINZBURG-LANDAU STUDIES OF SUPERFLUID HE3 Ph.D. Thesis
David Alan Dahl 1976 132 p
Avail: Univ. Microfilms Order No. 76-12989

Two independent topics in the field of condensed matter physics are examined; the condensed charge-Bose, charged Fermi gas and superfluid helium-three. The first chapter utilizes Green's function (field theoretic) methods to derive the low-temperature properties of a dense, neutral gas of condensed charged bosons and degenerate charged fermions. Restriction is made throughout to the case where the fermion mass is much lighter than the boson mass. Linear response and the density-density correlation function are examined and shown to exhibit two collective modes: a plasmon branch and a phonon branch with speed equal to that of ionic sound in solids. Use of the lowest-order dielectric function leads to boson single-particle excitations which are gapless and coincide with the phonon mode at long wavelengths, while the fermions retain their free-quasi-particle behavior. Dissert. Abstr.

N76-28068 Louisiana State Univ. and A&M Coll., Baton Rouge.
SPIN-ORBIT COUPLING EFFECTS IN BAND STRUCTURE OF FERROMAGNETIC TRANSITION METALS Ph.D. Thesis
Manjit Singh 1975 97 p
Avail: Univ. Microfilms Order No. 76-12941

A previous self consistent linear combination of atomic orbitals calculation of energy bands in ferromagnetic iron has been extended through the inclusion of spin-orbit coupling. The exchange interaction is incorporated according to the Xa method. The Fermi surface is described in detail and compared with the results of measurements of the de Haas-van Alphen effect, and of magnetoresistance anisotropy. The interband contribution to the optical conductivity tensor was computed using matrix elements determined from wave functions including spin-orbit coupling. Both diagonal and off diagonal elements of this tensor have been obtained. Expressions are derived in the tight binding method, for the shift in the g-factor of conduction electrons, produced due to spin-orbit interaction. Values for the g shift are calculated for iron and nickel using the results of band structure calculations that include spin-orbit coupling effects.
Dissert. Abstr.

N76-28069# Sandia Labs., Albuquerque, N.Mex.
SERIES STUDIES OF CRITICAL EXPONENTS IN CONTINUOUS DIMENSIONS
J. P. VanDyke and W. J. Camp 1975 8 p refs Presented at 21st Ann. Conf. on Magnetism and Magnetic Mater., Philadelphia, 9 Dec. 1975 Sponsored by ERDA
(SAND-75-5752; Conf-751209-3) Avail: NTIS HC $4.50

Through use of results previously derived for the high-temperature susceptibility expansion of classical models as a closed-form function of lattice dimension, a study was made of the dimensional dependence of the critical exponent emma and critical temperature, as well as the correction-to-scaling exponent delta, for Ising-like (n = 1) models. The numerical results were obtained by extrapolation of 10-th order series on loose-packed hypercubical lattices and 8-th order series on close-packed hypertriangular lattices. The critical exponent gamma increases monotonically with decreasing dimension, d, for $d < 4$, and apparently tends to infinity at $d = 1$; while the critical temperature decreases monotonically and smoothly to zero at $d = 1$. Detailed contact was made with the epsilon expansion estimates for critical exponents obtained in the context of renormalization group theory. Author (ERA)

N76-28070# California Univ., Livermore. Lawrence Livermore Lab.
PROGRAM FOR DEVELOPMENT OF HIGH-FIELD SUPERCONDUCTING MAGNETS FOR FUSION RESEARCH
18 Apr. 1975 87 p refs Sponsored by ERDA
(TID-26937) Avail: NTIS HC $7.75

A developmental program to develop multifilamentary Nb3Sn superconductor suitable for use in large CTR magnets is described. The result of this program is the fabrication of a rather large magnet and the determination of its performance limitations. In the second program, the developed multifilamentary Nb3Sn superconductor is used to construct the magnets for the Fusion Engineering Research Facility (FERF) machine. In this program, the bulk of the effort is in magnet design and winding. The third program includes the fabrication and testing of the superconducting magnets for the MX machine although, as explained in the Technical Plan, only the cost of the development work is included in this document. At the present time, Nb-Ti superconductor is being considered. Apart from some initial

conductor design work, the major effort is in magnet design and winding. Author (NSA)

N76-28071# California Univ., Livermore. Lawrence Livermore Lab.
SUPERCONDUCTING MAGNET DEVELOPMENT PROGRAM Progress Report, Jul. 1974 - Jun. 1975
D. N. Cornish, A. R. Harvey, R. L. Nelson, C. E. Taylor, and J. P. Zbasnik 24 Oct. 1975 123 p refs
(Contract W-7405-eng-48)
(UCRL-50031-75) Avail: NTIS HC $5.45

During FY 1975, the superconducting magnet development program was primarily directed toward the development of multifilamentary Nb3Sn conductor for large CTR machines. It was secondarily concerned with preliminary work for the MX experiment and with the acquisition of additional testing facilities. Among the significant achievements was the construction and operation of a 27-cm-bore coil to its short-sample limit of 7-T at the windings. The coil was wound with a 100-m length of 67,507-filament Nb3Sn conductor. Author (NSA)

N76-28072# Los Alamos Scientific Lab., N.Mex.
COHERENT PHENOMENA IN THE INTERACTION OF MOESSBAUER RADIATION WITH CRYSTALS (PROGRESS IN THEORY)
Yu. M. Kagan Nov. 1975 32 p refs Transl. into ENGLISH from the Polish report Presented at the Intern. Conf. on Moessbauer Spectroscopy, Cracow, Poland
(Contract W-7405-eng-36)
(LA-TR-75-33; Conf-750815-2) Avail: NTIS HC $5.00

Attention is focused on the analysis of results previously obtained in the theory of the coherent phenomena accompanying resonance interaction of Moessbauer radiation with crystals. Specific sections include: stimulated radiation of gamma quanta in a crystal under conditions of Bragg scattering, suppression of the broadening of a Moessbauer line caused by non-uniform isomer shift, and suppression of a non uniform isomer shift under conditions of resonant optical repopulation of the electronic levels. NSA

N76-28073# Oak Ridge National Lab., Tenn.
SUPERCONDUCTING COIL PROTECTION
E. L. Woods 1975 6 p refs Presented at 6th Symp. on Engr. Problems of Fusion Res., San Diego, Calif., 17 Nov. 1975 Sponsored by ERDA
(CONF-751125-74) Avail: NTIS HC $4.50

The protection system is based on a two-phase construction program. Phase I is the development of a reliable hardwired relay control system with a digital loop utilizing firmware and a microprocessor controller. Phase II is an expansion of the digital loop to include many heretofore unmonitored coil variables. These new monitored variables will be utilized to establish early quench detection and to formulate confirmation techniques of the quench detection mechanism. Established quench detection methods are discussed and a new approach to quench detection is presented. The new circuit is insensitive to external pulsed magnetic fields and the associated induced voltages. Reliability aspects of the coil protection system are discussed with respect to shutdowns of superconducting coil systems. Redundance and digital system methods are presented as related topics. Author (NSA)

N76-28074# National Bureau of Standards, Washington, D.C.
ION ANGULAR DISTRIBUTIONS IN ELECTRON STIMULATED DESORPTION, OXYGEN AND CO ON W/111/
Theodore E. Madey, Jerry J. Czyzewski, and John T. Yates, Jr. 31 Dec. 1975 26 p refs
(Contract NAonr-30-75)
(AD-A020524) Avail: NTIS CSCL 20/1

The ion angular distributions resulting from electron stimulated desorption (ESD) of oxygen and carbon monoxide chemisorbed on a tungsten (111) crystal have been determined. The O(+) ions released during ESD of adsorbed oxygen exhibit three-fold symmetric angular distributions in orientational registry with the W(111) substrate. The CO(+) and O(+) ions released during ESD of a monolayer of CO are desorbed normal to the (111) surface. Models for both oxygen and CO adsorption are discussed. The data for CO are consistent with adsorption of CO in 'standing up' carbonyl structures in the virgin and alpha CO binding states. Author (GRA)

N76-28075# Rensselaer Polytechnic Inst., Troy, N.Y.
ON ONE-DIMENSIONAL ACCELERATION WAVES AND ACOUSTOELECTRIC DOMAINS IN PIEZOELECTRIC SEMICONDUCTORS
M. F. McCarthy and H. F. Tiersten Jan. 1976 31 p refs
(Contract N00014-76-C-0302; NR Proj. 318-009)
(AD-A021058; TR-16) Avail: NTIS CSCL 20/12

A one-dimensional version of the general nonlinear electroelastic equations for deformable semiconductors recently presented is employed in the analysis. Consequently, the mechanical and dielectric nonlinearities are included in the analysis as well as the semiconduction nonlinearity. Equations are derived for both the propagation velocity and the amplitude of the growing disturbance as a function of the state of the material immediately ahead of the wavefront. These rather general results are specialized to the case of a homogeneous steady state ahead of the wave and the condition for the threshold field is determined. In this latter case the wavefront propagates with constant velocity and the amplitude equation indicates the formation of a shock in a finite time for conditions conductive to domain formation. When the electrical conduction equation, which can be quite general in this treatment, is specialized to the form usually employed for semiconductors, the aforementioned more general condition for the threshold field reduces to the known result. GRA

N76-28076# Texas Univ., Austin. Dept. of Physics.
CALCULATIONS OF SURFACE PROPERTIES OF CRYSTALS Final Report, 1 Oct. 1970 - 31 Aug. 1975
F. W. DeWette and G. Alldredge 30 Oct. 1975 21 p refs
(Grant AF-AFOSR-1973-71; AF Proj. 9761)
(AD-A021131; AFOSR-76-0043TR) Avail: NTIS CSCL 20/12

The work proposed for this grant encompassed a program of theoretical investigation of a number of problems in the structure and lattice dynamics of crystal structures, with the aim of developing basic knowledge of surface properties in support of materials technology. Three principal themes characterized the proposed work: (1) an investigation of intrinsic phenomena of structure and vibrations of well-characterized simple, but useful, crystal surfaces--such as ionic crystals and metals; (2) a study of the consequences such intrinsic phenomena have for the interaction with experimental probes used for investigating surfaces--such as infrared adsorption, low-energy electron diffraction, and low-energy molecule scattering; (3) an investigation of the influence of surface structure and dynamics on the interaction of 'foreign' atoms with crystal surfaces in cases for which the foreign atoms are in some sense bound to the surface--as in physical adsorption, desorption, etc. GRA

N76-28077# Washington State Univ., Pullman. Dept. of Chemistry.
LUMINESCENT TRANSITION METAL COMPLEXES IN MAGNETIC AND ELECTRIC FIELDS Final Report, 15 Sep. 1971 - 15 Sep. 1975
G. A. Crosby 1975 15 p refs
(Grant AF-AFOSR-2207-72; AF Proj. 9536)
(AD-A021108; AFOSR-76-0050TR) Avail: NTIS CSCL 20/10

During the grant period several important developments pushed the laboratory closer to its long term goal of designing materials with predetermined electro-optical properties. New materials were synthesized that were highly luminescent and amenable to spectroscopic investigation. Magnetic switching of luminescence was demonstrated, and the effect of external fields on excited states was quantified. Geometrical parameters of transition metal complex excited states were also determined. GRA

N76-28078# Pennsylvania State Univ., University Park. Materials Research Lab.
TEMPERATURE COMPENSATED PIEZOELECTRIC MATERIALS Semiannual Technical Report, 1 Jan. - 30 Jun. 1975
G. R. Barsch and K. E. Spear 15 Jul. 1975 37 p refs
(Contract F19628-75-C-0085; ARPA Order 2826)
(AD-A020358; AFCRL-TR-75-0609; SATR-1) Avail: NTIS CSCL 20/12

In order to search for new temperature compensated materials for surface acoustic wave (SAW) devices with low ultrasonic attenuation and high electromechanical coupling, the following experimental investigations were carried out: (1) Crystal growth experiments were performed on Ba2Ge2TiO8, Ba2Si2TiO8, and Pb2KNb5Oi5. Single crystals of Ba2Ge2TiO8 and of Pb2KNb5Oi5 of sufficient size and quality for property measurement were obtained. (2) For alpha-berlinite, AlPO4, measurement of the single crystal elastic constants, their temperature dependence, and the temperature dependence of the thermal expansion coefficient was completed, and estimates of the piezoelectric constants were obtained. (3) For beta-eucrypitite, LIAlSO4, the single crystal elastic constants were measured as a function of temperature and pressure. The temperature and pressure coefficients of all elastic constants are negative. GRA

N76-28079# Massachusetts Inst. of Tech., Cambridge. Crystal Physics and Optical Electronics Lab.
GROWTH AND EVALUATION OF CRYSTALS OF FOUR-LEVEL LASER MATERIALS Final Technical Report, 1 Oct. 1968 - 30 Apr. 1974
Jan. 1975 62 p refs
(Contract DAAK02-69-C-0047)
(AD-A020271) Avail: NTIS CSCL 20/12

This program was one of materials development work in four-level laser materials, with particular emphasis on obtaining room temperature laser action in the 940 nm region, largely with Nd(3+) as the activator ion. Initial work was concentrated on looking at LiYF4(YLF) as a material with the possibility of more efficient 940 nm operation and also with lower gain than YAG for Q-switched operation. While the 940 nm operation was not achieved, this research led to the use of this host with other ions in other programs leading to successful operation of alpha beta YLF:Ho (2.06 micrometers), YLF:Er (850 nm), and YLF:Tb (545 nm). Further work at the Night Vision Laboratory resulted in an evaluation of YLF:Nd(3+) as a 1.06 micrometer laser. A program is described investigating Ba2MgGe2O7 (BMAG) and Ba2ZnGe2O7 (BZAG) and various glasses based on these compositions. Studies were made of complex germanate garnet hosts, most particularly BaY2Mg2Ge3O12 (BAMGAR) and CaY2MgGe3O12 (CAMGAR) as neodymium laser materials.GRA

N76-28080# Harry Diamond Labs., Adelphi, Md.
ELECTRON-HOLE PAIR-CREATION ENERGY IN SiO2
George A. Ausman and Flynn B. McLean Nov. 1975 15 p refs
(DA Proj. 1T1-61102-B-11A)
(AD-A020190; HDL-TR-1720) Avail: NTIS CSCL 20/12

The average energy W required to create an electron-hole pair in SiO2 has been determined to be approximately 18 eV by consideration of the energy loss of fast electrons in solids. This energy is lost primarily by plasmon production and subsequent decay of the plasmons into electron-hole pairs. Also, recent data on electron-irradiated SiO2 films can be explained remarkably well by a columnar recombination model. The extrapolation to infinite electric field of the columnar model fit to the data yields a value for W that is in excellent agreement with the value obtained from the energy loss calculation. GRA

N76-28081# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
X-RAY PHOTOEMISSION FROM COATED SURFACES Final Report
Melvin J. Berstein and Kenneth W. Paschen 19 Dec. 1975 27 p refs
(Contract F04701-75-C-0076)
(AD-A020161; TR-0076(6124)-2; SAMSO-TR-75-302) Avail: NTIS CSCL 20/8

X-ray photoemission from the following types of coated and low-z surfaces was measured: dielectric films backed by a conductor, painted metal foils, and low-z conductors. Steady-state irradiation was provided by an X-ray tube operated at 60 and 100 kV. The total emission current from front and/or back surfaces was measured for photons incident at 0 deg and 60 deg. Surfaces studied included: Be, CH sub 2 graphite, Mylar, Teflon, glass, PVC, and Saran plus various coatings of low-z and high-z paints on aluminum. Low-energy secondary electrons, which contributed up to 30 percent of the total emission, were retarded with a biased grid. On a few higher-z dielectrics, buildup depressed the measured photoemission currents around zero bias. Photoemission yields increased approximately as the cube of an effective atomic number, and CH sub 2 had the lowest observed photoemission yield. The yield from beryllium was two to three times that of CH sub 2; this large yield is several times higher than expected for pure Be and is attributed to a thick oxide layer. Present measured values plus previously-measured values of photoemission from metals are compared with results obtained from the QUICKE2 computer code, and agreement within 20 percent was found for most materials. Photoemission from a copper foil coated with low-z varnish was also measured as a function of varnish thickness. The observed emission decreased approximately exponentially with coating thickness to a minimum value corresponding to emission from varnish only. A simple model was developed to estimate such photoemission from a high-z metal coated with a thin low-z layer. GRA

N76-28082# Virginia Polytechnic Inst. and State Univ., Blacksburg.
NONCRYSTALLINE SEMICONDUCTORS: ELECTRICAL AND THERMAL PROCESSES Final Report, 1 Jan. - 30 Dec. 1975
Lyle H. Slack 20 Dec. 1975 14 p refs
(Grant DAHC04-74-G-0081)
(AD-A020138) Avail: NTIS CSCL 20/12

Unstable switching was observed in numerous oxide and chalcogenide thin films. Stable switching, when observed, is due to a localized temperature rise in a micron-sized location of the film. Unstable switching is probably due to such local heating which results in local destruction of the film. The electrical and optical characteristics of undoped and doped SnO2, Co3O4, Fe2O3, TiO2, and VO(x)H(y) are reported. A technique for the low temperature pyrolitic deposition of oxide thin films was developed. The ability of V2O5, TiO2, Mn3O4, ZnO, and Cr2O3 thin films to sense changes in oxygen partial pressure was established. GRA

N76-28083# California Univ., Irvine. Dept. of Physics.
DYNAMICAL LOWERING OF SITE SYMMETRY BY JAHN TELLER EFFECTS IN RESONANT RAMAN SCATTERING
E. Mulazzi and M. F. Bishop 20 Dec. 1975 11 p refs Prepared in cooperation with Milan Univ.
(Contract N00014-69-A-0200-9003; Grant AF-AFOSR-2887-76; AF Proj. 9763)
(AD-A021197; Rept-75-52) Avail: NTIS CSCL 20/12

Theoretical results are given for the temperature dependent breakdown of the Raman scattering selection rules induced by a dynamical lowering of the site symmetry in systems that exhibit the dynamic Jahn Teller effect in the excited electronic states. GRA

N76-28084# California Univ., Los Angeles. Dept. of Physics.
A STUDY OF THE TRAPPING OF SUPERFLUID PERSISTENT CURRENTS IN SUPERLEAKS Interim Technical Report
Joseph Edward Heiserman Dec. 1975 154 p refs
(Contract N00014-75-C-0246; NR Proj. 384-302)
(AD-A020927; TR-38) Avail: NTIS CSCL 20/13

Persistent currents in superleaks in contact with bulk superfluid helium were investigated using Doppler shifts of the two acoustic modes of an annular resonator partially packed with superleak, and with a simple gyroscopic technique. The two modes have been studied between the temperatures 1.2K and the lambda temperature for annuli filled to various depths with superleak. The Doppler shifts of the acoustic modes were used to obtain the persistent current velocities in the unpacked and packed regions of the resonator. Observations were made on a bare superleak using a simple gyroscopic apparatus suspended from a torsion wire. When the superleak is tilted with a persistent current, the change in the angular momentum vector leads to a torque which causes the gyroscope to swing on the torsion wire. The temperature dependence of the current in the bare superleak was found to be approximately the same as that observed in other experiments on a superleak completely enclosed by metal walls. GRA

N76-28085# Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy.

DEFORMATION AND FRACTURE STUDIES OF BICRYSTALS Final Technical Report, 1 May 1972 - 31 Dec. 1975
Y. T. Chou Jan. 1976 12 p refs
(Contract AF-AFOSR-2326-72; AF Proj. 9761)
(AD-A021149; AFOSR-76-0104TR) Avail: NTIS CSCL 20/2

Several basic aspects concerning the effects of grain boundaries in niobium bicrystals were explored. The investigation led to the following findings: (1) A new method of growing oriented niobium bicrystals (the Y shaped seed technique) was developed. Large cylindrical bicrystals, 0.63 cm in diameter and over 10 cm in length, have been grown from the melt using this method. (2) Niobium bicrystals exhibit excess hardening at the grain boundary, as shown by microhardness measurements. The degree of boundary hardening increased as the angle of misorientation increases. In addition, hardening is greater in bicrystals with tilt boundaries than with twist boundaries. (3) In tensile deformation of niobium bicrystals, Stage I hardening is absent. In Stage II, extra slip traces are activated from the boundary. In some cases, the primary slip system of the bicrystal differs from that of the single crystal of similar orientation. (4) In conjunction with the experimental program, a refined analysis was made to examine the dislocation-boundary interaction. It was found that in non-symmetrical bicrystals an edge dislocation wall has a long-range stress field which contrasts with the classical result in a single crystal. Author (GRA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N76-28086# Army Materiel Command, Redstone Arsenal, Ala. SAM-D Project.
RESTATEMENT OF THE HEISENBERG UNCERTAINTY PRINCIPLE FOR THE CONDITION OF SUPERPOSITION
Thomas E. Bearden 8 Oct. 1975 16 p refs
(AD-A020797; SAM-D-76-2) Avail: NTIS CSCL 20/10

This report presents a discussion of the Heisenberg uncertainty principle for the condition of superposition. In that changed form, the principle becomes causal and rigidly quantized, but applies to unperceived reality (probability), consistent with Bohr's interpretation that probability waves are causally propagated in time. The connection between the two statements of uncertainty/certainty provide a basis for the transfer function that describes the operation of perception itself. GRA

N76-28087# Army Materiel Command, Redstone Arsenal, Ala. SAM-D-Project.
A CONCEPTUAL DERIVATION OF EINSTEIN'S POSTULATES OF SPECIAL RELATIVITY
Thomas E. Bearden 8 Oct. 1975 16 p
(AD-A020799; SAM-D-76-4) Avail: NTIS CSCL 20/10

This report presents a discussion and conceptual derivation of Einstein's postulates of special relativity. The perceptron approach appears to be a fundamentally new manner of regarding physical phenomena, and it is hoped that physicists will interest themselves in the concept. GRA

N76-28088# Army Materiel Command, Redstone Arsenal, Ala. SAM-D Project.
A POSTULATED MECHANISM THAT LEADS TO MATERIALIZATION AND DEMATERIALIZATION OF MATTER AND TO ANTIGRAVITY
Thomas E. Bearden 8 Oct. 1975 18 p refs
(AD-A020796; SAM-D-76-1) Avail: NTIS CSCL 20/10

This report presents a discussion of the postulated mechanism that leads to the materialization and dematerialization of matter and to antigravity. The mechanism also explains why an orbital electron does not radiate energy, in contradiction to classical electromagnetic theory. One of the paradoxes of special relativity is explained. A new model of a photon is advanced. The relativistic increase of mass with velocity is explained. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N76-28089*# Evaluation Technologies, Inc., Arlington, Va.
SPACE SYMPOSIUM/76 Final Report
1 Jul. 1976 54 p refs Symp. held at Washington, D. C., 7-9 Apr. 1976; Sponsored by Howard Univ. and NASA Sponsored by NASA
(NASA-CR-147941) Avail: NTIS HC $4.50 CSCL 05I

A symposium dealing with career opportunities in the aerospace program for minorities was conducted and evaluated. The symposium was attended by students from eleven predominantly minority colleges and universities in and around Washington, D. C. and the eastern region, and from high schools in five jurisdictions of the Washington metropolitan area. Speakers included representatives of Howard University, NASA, and private industry. On display during the symposium was a NASA exhibit of moon rocks, space shuttles, a lunar module, command module, pacemaker, LANDSAT, and other items of interest.
Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N76-28090# Pennsylvania Univ., Philadelphia. Dept. of Decision Sciences Management.
THE APPLICATION OF ARTIFICIAL INTELLIGENCE TO DECISION AIDING Interim Report
Rob Gerritsen Oct. 1975 20 p refs Presented at Workshop on Appl. of Interactive Cybernetic Systems, White Sands Missile Range, New Mex., 14-16 Oct. 1975
(Contract N00014-75-C-0440; NR Proj. 049-360)
(AD-A020652; Rept-75-10-03) Avail: NTIS CSCL 05/8

In a number of ways Artificial Intelligence can be applied to the design of a single data structure which is useful for a group of decision makers, and can be applied to subsequently retrieve data from that structure in a form suitable for a particular decision maker. The goal of a decision aiding system is to extend or augment man's capacity for problem solving and decision making. Possible ways that Artificial Intelligence technology can aid in the various phases of the decision making process are discussed. GRA

N76-28091# RAND Corp., Santa Monica, Calif.
CURVES: A COST ANALYSIS CURVE-FITTING PROGRAM Interim Report
H. E. Boren, Jr. and G. W. Corwin Dec. 1975 103 p refs
(Contract F44620-73-C-0011)
(AD-A020141; R-1753-PR) Avail: NTIS CSCL 05/1

The report describes a FORTRAN-4 curve-fitting computer program (CURVES) that makes least-squares determinations of the parameters of any of eight types of equations selected by the user, given a set of observations on the dependent and independent variables of interest. The types of equations that can be fitted are: linear, quadratic, power, asymptotic-power, exponential, logarithmic-linear, and two types of semilogarithmic-linear. Except for the quadratic and asymptotic-power equations, up to seven independent variables may be used. Y-intercepts may be specified for all equations except the power and exponential. A correlation matrix of the input data is provided for all fitted equations using more than one independent variable. Also included are standard errors and Student's t-ratios of the parameters, significance levels, beta coefficients, and the Durbin-Watson statistic. A plot routine is also incorporated. The program is fairly small (about 86,000 bytes of core), fast in execution time, and hence cheap to operate. GRA

N76-28092# Dikewood Corp., Albuquerque, N.Mex.
A MANAGEMENT INFORMATION SURVEY OF THE TEST AND EVALUATION SYSTEMS PROGRAM OFFICE Final Report
C. A. Luff Kirtland AFB, N. Mex. AFSWC Feb. 1976 34 p refs
(Contract F29601-74-C-0022)
(AD-A020822; DC-TR-1242-6; AFSWC-TR-75-9) Avail: NTIS CSCL 05/1

A study was conducted to determine TESPO's needs for a management information system and to establish management's general information requirements. TESPO's mission, tasks and organizational plans were studied, interviews were conducted, and the literature was searched to complete the effort. It was concluded from the study that the current TESPO management systems and procedures be augmented by additional manual techniques to handle and process information and by automated network analysis as needed. It was concluded that TESPO's information requirements can be met, with minor modifications, by using contemporary project management principles and methods. A preliminary recommendation is made to design, develop and implement a manual management information system augmented as needed by automated analyses as the 'best' cost effective option in the short-term. Author (GRA)

N76-28093# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AIRCRAFT AIRFRAME COST ESTIMATION BY THE APPLICATION OF JOINT GENERALIZED LEAST SQUARES M.S. Thesis
Vernon Handel Nov. 1975 120 p refs
(AD-A020228; GOR/SM/75D-7) Avail: NTIS CSCL 05/1

Joint Generalized Least Squares is a statistical technique which allows for the interaction of a set of regression equations through correlated disturbances. Aircraft airframe cost estimation may be accomplished by disaggregation into elements of cost such as material, labor, tooling, and engineering. Data for various types of aircraft are used to demonstrate the effect of using Joint Generalized Least Squares in developing cost estimating relationships for the elements of airframe cost. A comparison is made to relationships developed using Ordinary Least Squares. Dependent on the number of observations, the number of relationships developed jointly, and the different explanatory variables used, the variance of the relationships may be reduced by using Joint Generalized Least Squares. The Joint Generalized Least Squares technique is extended to permit revision of predictions using the joint distribution of the elements of cost. GRA

N76-28094# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROECONOMIC THEORY APPLIED TO PARAMETRIC COST ESTIMATION OF AIRCRAFT AIRFRAMES M.S. Thesis
William E. Dunne Dec. 1975 86 p refs
(AD-A020210; GOR/SM/75D-3) Avail: NTIS CSCL 05/1

The theories of microeconomics and optimal control were used to formulate a parametric cost estimation model that provides an insight into the cost flow of an aircraft airframe production program. The model developed uses original total airframe quantity (volume) and initial total production contract time. as well as the traditional values of cumulative quantity, AMPR weight, and speed, as explanatory variables. A form of the model was solved by both a constrained least squares approach and by a nonlinear algorithm with similar results. In the analysis of the model the parameters of volume and time were not found to be statistically significant. The surrogate variables of actual contract volume and time do not explain a significant amount of the total program cost. Several reasons are offered in the thesis. Validation of the model indicates that it is a highly satisfactory estimator of total program cost. GRA

N76-28095# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A COMPUTER SIMULATION OF MAINTENANCE MANPOWER REQUIREMENTS FOR THE DC-130H, VOLUME 1 M.S. Thesis
Gerald A. Yates and Richard Fritz Oct. 1975 145 p refs
(AD-A020229; GOR/SM/75D-5) Avail: NTIS CSCL 05/9

This thesis develops a simulation program, using the Logistics COMposite (L-COM) Model, to represent the maintenance environment and associated manpower required to support the DC-130H aircraft. Data sources for this project included: the TAC MET Study of DC-130 maintenance facilities; maintenance data collection tapes from Dyess, Langley, Little Rock and Pope Air Force Bases; Technical orders; and conversations with experienced maintenance personnel. The program is designed around a typical maintenance organization which provides scheduled maintenance, unscheduled maintenance and phase inspections in support of a basic flying operation. GRA

N76-28096# Mitre Corp., Bedford, Mass.
AN AIR FORCE GUIDE TO CONTRACTING FOR SOFTWARE ACQUISITION
N. E. Bolen Jan. 1976 45 p refs
(Contract F19628-76-C-0001; AF Proj. 572H)
(AD-A020444; MTR-3118; ESD-TR-75-365) Avail: NTIS CSCL 09/2

This document is one of a series of guidebooks for software acquisition management. The guidebooks are being prepared for use by Air Force Program Office personnel who are responsible for planning and managing the development of software. This guidebook covers contracting aspects from early procurement planning through the source selection process to the management of the contractor's work. GRA

N76-28097# Oregon Univ., Eugene. Dept. of Management.
PROBLEMS IN THE MEASUREMENT OF ORGANIZATIONAL EFFECTIVENESS
Richard M. Steers Nov. 1975 32 p
(Contract N00014-76-C-0164; NR Proj. 170-812)
(AD-A018709; TR-1) Avail: NTIS CSCL 05/1

Multivariate models of organizational effectiveness are reviewed in terms of their primary evaluation criteria, their normative or descriptive nature, their generalizability, and their derivation. Little consistency was found in the evaluation criteria of the models. Problems of such models are discussed which appear to reduce their utility for the study or organizational effectiveness. Suggestions are given for future work to focus on operative goals and goal optimization to further understanding of the effectiveness construct in on-going organizations. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N76-28098# California Univ., Berkeley. Lawrence Berkeley Lab.
PRICING OF INFORMATION: A MODEL FOR SELECTIVE DISSEMINATION OF INFORMATION SERVICES Ph.D. Thesis
H. W. Zais Sep. 1975 265 p refs
(Contract W-7405-eng-48)
(LBL-4257) Avail: NTIS HC $10.00

A modified descriptive model from the field of industrial organization was applied to pricing of an information service, computer-assisted selective dissemination of information (SDI). The objective was to determine if identifying the market structure of SDI centers, through use of the structure and conduct components of the model, could provide predictive indicators as to what SDI pricing behavior would be like. A market structure was identified for the industry and, on the basis of this structure, pricing conduct patterns were suggested. Information on various user groups revealed market segments with differing potentials for growth and with different price elasticities of demand for SDI service. On the basis of this structure, oligopolistic pricing conduct patterns were suggested and compared with SDI pricing policies and practices observed in the data of the survey. Author (ERA)

N76-28099# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
INFORMATION PROCESSING SYSTEMS ANALYSIS AND DESIGN Progress Report, 1 Jan. - 30 Sep. 1975
D. Teichroew 1975 19 p refs
(Contract E(11-1)-2544)
(COO-2544-1) Avail: NTIS HC $4.50

A structural computer-aided methodology of stating, recording, and analyzing requirements for Information Processing Systems was developed. The methodology includes a formal language, Problem Statement Language, and a software system, Problem Statement Analyzer. The system is operational on a number of large computers, and is used by a number of public and private organizations. The major features of the language and the system are described. Author (ERA)

N76-28100# Naval Electronics Lab. Center, San Diego, Calif.
ADVANCED MAIL SYSTEMS SCANNER TECHNOLOGY Annual Report, 22 Oct. 1974 - 21 Oct. 1975
Frank C. Martin 22 Oct. 1975 125 p refs Sponsored by US Postal Service
(NELC Proj. N451)
(AD-A020175; NELC-TR-1965; AR-1) Avail: NTIS CSCL 05/2

The objective of the effort described herein is to provide technical consultation, equipment, and support services to the U.S. Postal Service which will contribute to the development of the system definition of a new-concept processing system, the Electronic Message Service (EMS). Included in the scope of effort are investigations of high-speed image scanning technology, image frame memory storage, image enhancement, and the fabrication of a scanner/frame store memory test assembly. Author (GRA)

N76-28101# Defense Documentation Center, Alexandria, Va.
INFORMATION SCIENCES: DATA AND INFORMATION HANDLING, STORING, RETRIEVING AND DISSEMINATION: A BIBLIOGRAPHY, JUNE 1965 - JUNE 1975
Jan. 1976 422 p refs
(AD-A020200; DDC/BIB-75/17) Avail: NTIS CSCL 05/2

This bibliography is a compilation of citations on information sciences: data and information handling, storing, retrieving and dissemination. This report includes references on storage and retrieval techniques, file updating, thesaurus building and information dissemination research. Four computer-generated indexes provided are Corporate Author-Monitoring Agency, Subject, Title and Personal Author. GRA

N76-28102# PRC Information Sciences Co., McLean, Va.
AIR FORCE MILITARY PERSONNEL CENTER MICROFORM SYSTEM. SYSTEM DESCRIPTION: TEST AND EVALUATION RESULTS, VOLUME 2 Final Technical Report, 1 Jan. 1971 - 15 May 1975
J. K. Garner, B. H. Gilbert, D. R. Perry, and J. T. Cathcart Nov. 1975 225 p
(Contract F30602-71-C-0157)
(AD-A020074; RADC-TR-75-248-Vol-2) Avail: NTIS CSCL 05/2

This document is the second volume of a two-volume final report on the design, development, implementation and test and evaluation of the AFMPC Microform System. This volume presents detail description and supporting data and analysis of the Microform System. The Microform System is a document storage and retrieval system in which photographically reduced images of the Air Force personnel records, which must be retained under Title 44 of the U.S. Code, are maintained and managed. The conversion and maintenance process and the retrieval and dissemination process are completely described. System operational cost for current operation levels as well as maximum operation costs are presented. GRA

N76-28103# PRC Information Sciences Co., McLean, Va.
AIR FORCE MILITARY PERSONNEL CENTER MICROFORM SYSTEM: EXECUTIVE SUMMARY Final Technical Report, 1 Jan. - 15 May 1975
J. K. Garner, B. H. Gilbert, D. R. Perry, and J. T. Cathcart Nov. 1975 35 p
(Contract F30602-71-C-0157)
(AD-A020073; RADC-TR-75-248-Vol-1) Avail: NTIS CSCL 05/2

The design, development, implementation, and test and evaluation of the Air Force Military Personnel Center Microform System are described. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N76-28104# Army Aviation Systems Command, St. Louis, Mo.
HISTORICAL INFLATION PROGRAM Final Report
Ralph W. Lilge Jan. 1976 37 p refs
(AD-A020669; USAAVSCOM-TR-76-1) Avail: NTIS CSCL 05/3

This report extends, revises, and summarizes previous efforts to develop the necessary rationale and methodology necessary to construct historical inflation indices relative to Army aircraft. In addition, a computerized Historical Inflation Program is presented and described. The program can be updated monthly, is easily revised for changes in Bureau of Labor Statistics methods, and capable of handling data through the transition year, FY 7T. Output is expressed as monthly, quarterly, calendar year inflation indices (in Calendar Year 1967 base) and inflation factors (in any Fiscal Year base). These indices and factors provide a means of accurately adjusting historical cost data to constant year dollars. Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N76-28105# Committee on Government Operations (U. S. Senate).
UNITED STATES AGREEMENTS FOR COOPERATION IN ATOMIC ENERGY: AN ANALYSIS
Washington GPO 1976 198 p refs Analysis for Comm. on Govt. Operations, 94th Congr., 2d Sess., Jan. 1976 Prepared by Library of Congr., Congressional Res. Service
(GPO-64-626) Avail: SOD HC $2.50

Nuclear cooperation in relation to proliferation of the ability to make nuclear weapons and legislation to reorganize certain export functions of the Federal Government are examined. Factors relevant to negotiation and administration of the agreements for cooperation are reported. B.B.

N76-28106# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1977, VOLUME 1, PART 3
Washington GPO 1976 1214 p Hearings on H.R. 11573 (superseded by H.R. 12453) before Subcomm. on Space Sci. and Applications of Comm. on Sci. and Technol., 94th Congr., 2d Sess., No. 63, 28-29 Jan.; 3-5, 13-14, 17 and 19 Feb. 1976
(GPO-70-012) Avail: Subcomm. on Space Sci. and Applications

The hearings concerning the NASA Technology Utilization Programs are reported. Publications and technology applications are discussed including the international programs. The research and program management budget plan is presented by function. F.O.S.

N76-28107# Rhode Island Univ., Kingston. Law of the Sea Inst.
CONTEMPORARY LAW OF THE SEA: TRANSPORTATION, COMMUNICATION AND FLIGHT
William T. Burke Nov. 1975 44 p refs Prepared in cooperation with Washington Univ., Seattle
(Grants NOAA-04-5-158-48; NOAA-04-3-158-3)
(PB-249924/2; NOAA-76012712; Paper-28) Avail: NTIS HC $4.00 CSCL 05D

Contemporary international law of the sea pertaining to the movement of vessels and aircraft on, over, and under the oceans is examined. Special attention is devoted to the recent law of the sea (LOS) negotiations and proposals. After initial broad description of basic claims and fundamental policies, discussion centers upon the major categories of claim and counterclaim, the more detailed policy considerations involved, and the trends in decision respecting each category of claim, including description of major LOS proposals and the Single Text. Trends are assessed in terms of suggested policies, and recommendations are offered. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N76-28108*# ECON, Inc., Princeton, N.J.
A REVIEW OF THE ECONOMIC IMPLICATIONS OF THE NATIONAL ACADEMY OF ENGINEERING 1974 STUDY OF THE POTENTIAL APPLICATION OF SPACE SYSTEMS Final Report
Sep. 1975 141 p refs
(Contract NASw-2558)
(NASA-CR-148155; Rept-75-127-2) Avail: NTIS HC $6.00 CSCL 05C

User benefits resulting from the application of space systems to previously described application areas were identified, and methods to assign priorities to application areas and to quantify the benefits were described. The following areas were selected for in-depth review: communications, materials processing in space, weather and climate, and institutional arrangements for space applications. Recommendations concerning studies that should be undertaken to develop a more precise understanding of the source and magnitude of the realizable economic benefits were also presented. Author

N76-28109*# ECON, Inc., Princeton, N.J.
A PLAN FOR THE ECONOMIC ASSESSMENT OF THE BENEFITS OF IMPROVED METEOROLOGICAL FORECASTS
Ranendra Bhattacharyya and Joel Greenberg 31 Aug. 1975 85 p refs
(Contract NASw-2558)
(NASA-CR-148328; Rept-75-128-1) Avail: NTIS HC $5.00 CSCL 05C

Benefit-cost relationships for the development of meteorological satellites are outlined. The weather forecast capabilities of the various weather satellites (Tiros, SEOS, Nimbus) are discussed, and the development of additional satellite systems is examined. A rational approach is development that leads to the establishment of the economic benefits which may result from the utilization of meteorological satellite data. The economic and social impacts of improved weather forecasting for industries and resources management are discussed, and significant weather sensitive industries are listed. J.R.T.

N76-28110# Committee on Aeronautical and Space Sciences (U. S. Senate).
TECHNOLOGY UTILIZATION
Washington GPO 1975 521 p refs Hearings before Subcomm. on Aerospace Technol. and National Needs of Comm. on Aeron. and Space Sci., 94th Congr., 1st Sess., 22-24 Sep. 1975
(GPO-60-576) Avail: SOD HC $4.40

The economic benefits of NASA programs and practical applications of aerospace technology to modern life are examined. Topics discussed are: (1) the dynamic structural analysis technique of NASTRAN and its application to civil engineering, (2) study of atherosclerosis in man and by the use of digital image processing of X rays of clogged arteries, (3) gas turbines used in electric power production, (4) cryogenic insulation, and (5) semiconductors such as metal oxide semiconductors and integrated circuits. Mathematical models are given for the demand and supply projections for the various technological developments generated from NASA programs, and probable monetary gains that can be expected are outlined. J.R.T.

N76-28111# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
LONG DISTANCE RAIL TRANSPORTATION. PART A: RAPID RAIL TRANSPORTATION USING NONCONTACTING TECHNOLOGY [SPURGEFUEHRTER FERNVERKEHR. TEIL A: SPURGEBUNDENER SCHNELLVERKEHR MIT BERUEHRUNGSFREIER FAHRTECHNIK]
Dec. 1975 166 p refs In GERMAN; ENGLISH summary Proc. of the Statusseminar, Schliersee, West Ger., 10-12 Mar. 1975 2 Vol.
(BMFT-FB-T-75-36-Pt-A) Avail: NTIS HC $6.75; ZLDI, Munich DM 34,90

Status reports are presented on research and development in the Federal Republic of Germany. Topics are centered around magnetic levitation technology. Repulsive and attractive approaches and associated track problems are discussed. Problems connected with a test facility for transportation technologies are outlined. ESA

N76-28112# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
LONG DISTANCE RAIL TRANSPORTATION. PART B: RAPID RAIL TRANSPORTATION USING WHEEL/RAIL TECHNOLOGY [SPURGEFUEHRTER FERNVERKEHR. TEIL B: SPURGEFUEHRTER FERNVERKEHR MIT RAD/SCHIENE-TECHNIK]
Dec. 1975 122 p refs In GERMAN; ENGLISH summary Proc. of the Statusseminar, Schliersee, West Ger., 12-14 Mar. 1975 2 Vol.
(BMFT-FB-T-75-37-Pt-B) Avail: NTIS HC $5.50; ZLDI, Munich DM 25,65

Status reports are presented on research and development in the Federal Republic of Germany. Topics are centered around wheel/rail technology. The subsystems track, vehicle, operations management, and environmental questions, as well as the rail dynamics simulator and a research vehicle, are discussed. Planned medium term activities for 1975 to 1979 are described. ESA

N76-28113# Porsche (Ferdinand) AG, Stuttgart (West Germany).
UTILIZATION OF BRAKE ENERGY IN INDIVIDUAL VEHICLES FOR REDUCTION OF CONSUMPTION AND EXHAUST EMISSION Final Report [NUTZUNG DER BREMSENERGIE IN INDIVIDUALFAHRZEUGEN ZUR VERBRAUCHSUND ABGASEMISSIONSMINDERUNG]
Fritz Hartig and Reinhard Hofmann Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1975 187 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-38) Avail: NTIS HC $7.50; ZLDI, Munich DM 39,30

The possibilities of hybrid drives for brake energy utilization are explained in view of the energy shortage. Expenditure for and utility of the brake energy utilization are compared by means of selected drives and appropriate vehicles based on the principles of driving mechanics as well as of storage and conversion techniques. Despite an undeniable reduction of consumption, economical reasons oppose the general introduction of this system into series production. In special applications, such as taxis and buses etc., the regenerative brake may be useful. Author (ESA)

N76-28114# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
PLOTTING OF THE DYNAMIC SIMULATION MODEL OF THE ASIMO. TEST PHASE 1 [ERSTELLUNG DES DYNAMISCHEN SIMULATIONSMODELLS DER ASIMO. TESTPHASE 1]
W. Duffek, U. Federl, W. Kortuem, R. Richter, and O. Wallrapp 25 Sep. 1975 107 p refs In GERMAN
(DLR-IB-A-552-75/34) Avail: NTIS HC $5.50

Development of the ASIMO program, a general simulation

program for vehicles, is reported, in particular the preparation of a dynamic vehicle simulation model based on the equations of motion. Three types of model are distinguished, corresponding to vehicles with static suspension, with primary and secondary suspension, and with an elastic track. Results are presented for an electromagnetic suspension vehicle test model. These show that the 46 eigenvalues of this vehicle can be typically grouped and interpreted. Track durations are determined by vehicular mass forces and only a little by the variable part of the magnetic forces. Meaningful numerical results may be expected for only carefully selected integration methods, notably those using constant steps. ESA

N76-28115# European Space Agency, Paris (France).
DESCRIPTION AND CRITICAL ANALYSIS OF THE NASA TECHNOLOGY TRANSFER TO THE US AND FOREIGN INDUSTRY WITH REGARD TO THE TRANSFER OF TECHNOLOGY TO DEVELOPING NATIONS
Juergen Schulte-Hillen et al Feb. 1976 66 p refs Transl. into ENGLISH of 'Darstellung u. kritische Anal. des NASA-Technol. -Transfers zur in- u. auslaendischen Ind. unter Beruecksichtigung des Transfers von Technol. in Entwicklungslaender', DFVLR, Porz, West Ger. Report DLR-FB-74-41, 30 May 1974 Original German report available from DFVLR, Porz, West Ger. DM 32.70
(ESA-TT-242; DLR-FB-74-41) Avail: NTIS HC $4.50

The necessity for technology transfer resulting from increasing research and development funded by the government is explained. The technology utilization program derived from the NASA charter is described, including the function of the computerized NASA data system, tech briefs, and regional dissemination centers. Examples of technology transfer to developing countries are described in the study of Brazil and in the Korea Institute of Science and Technology project. Some results of the transfer program within the U.S. and to the developing countries are discussed with respect to projects involving the Federal Republic of Germany. Author (ESA)

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N76-28116 Indiana Univ., Bloomington.
A FOUR COLOR AND HBETA PHOTOMETRIC STUDY OF THE ASSOCIATION ORION OB 1 Ph.D. Thesis
Wayne Hutchinson Warren, Jr. 1975 566 p
Avail: Univ. Microfilms Order No. 76-11449

A study of the entire Orion OB 1 association has been carried out using photoelectric UVBY beta photometry. The observational program consisted of 526 mostly early type stars and is reasonably complete for association members earlier than A0. A complete cross identification table and compilation of previous UBV photometry and MK spectral classification are presented, in addition to identification charts for the stars included. Association membership was evaluated qualitatively using a compilation of FK4 proper motions, radial velocities, and distance criteria. Dissert. Abstr.

N76-28117 Cornell Univ., New York.
INFRARED ASTRONOMICAL SPECTROSCOPY FROM HIGH ALTITUDE AIRCRAFT Ph.D. Thesis
David Francis Schaack 1975 138 p
Avail: Univ. Microfilms Order No. 76-12890

Two separate infrared astronomical observing programs are described which were carried out using telescopes mounted in aircraft flying above the tropopause. In the first program, the spectral reflectivity of the planet Mars was measured in the 2 micron to 4 micron wavelength region from the NASA Convair 990. The existence of a previously discovered broad and deep minimum in the reflectivity at about 3 micron thought to be due to water of hydration in the soil, was confirmed. By considering the known size range of the Martian dust particles, it was found that the absorption band is consistent with the soil containing about 1% of bound water by mass. This result shows that the soil can be an important sink for liquid water which may have existed during previous epochs on Mars. In the second program, a completely liquid helium cooled spectrometer for the 16 micron to 40 micron region was designed and constructed. This instrument was used to measure the 20 to 40 micron spectrum of the molecular cloud region of the Orion Nebula (M42) from the NASA Lear Jet. Dissert. Abstr.

N76-28118 Cornell Univ., New York.
PHOTOMETRIC STUDIES OF PHOBOS, DEIMOS, AND THE SATELLITES OF SATURN Ph.D. Thesis
Michael C. Noland 1975 275 p
Avail Univ. Microfilms Order No. 76-12881

The Mariner 9 camera system is used to make large phase angle polarimetric and photometric measurements of Phobos and Deimos at effective wavelength of 0.56 microns. The photometric analysis includes effects caused by the irregular shapes of the satellites. The average reflectance of Deimos/Phobos is 1.15 + or - 0.010 mag/deg. Six-color photometric observations made during Saturn's 1972/73 opposition are used to separate the solar phase and orbital phase contributions to the observed light variations of Lapetus, Titan, Rhea, Dione, and Tethys. Titan shows no orbital variations, but has phase coefficients which range from negligible values in the infrared to 0.014 mag/deg in the ultraviolet. Dissert. Abstr.

N76-28119 New Mexico State Univ., University Park.
AN OBSERVATIONAL AND THEORETICAL INVESTIGATION OF CALCIUM 2 H AND K EMISSION IN YELLOW SUPERGIANTS AND CLASSICAL CEPHEIDS Ph.D. Thesis
Dennis Ray Hollars 1976 184 p
Avail: Univ. Microfilms Order No. 76-12639

Relative flux profiles for the Ca II H and K lines in yellow supergiants and classical Cepheid variables were obtained from spectrographic observations made at Kitt Peak National Observatory and the Blue Mesa station of the N.M.S.U. Observatory. The data confirm that the Ca II emission width in Cepheids violates the Wilson-Bappu (W-B) relationship for nonvariable stars. However, the profiles for zeta Gem reveal previously unreported Ca II emission on the falling branch of the light curve just past maximum light. Since this emission is not as wide as that which normally occurs on the rising branch, an internal contradiction to the W-B relation is suggested. The discrepancy between the emission widths in Cepheids and yellow supergiants is examined. Dissert. Abstr.

N76-28120*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ALL-SKY MONITOR OBSERVATIONS OF THE DECAY OF A0620-00 (NOVA MONOCEROTIS 1975)
L. J. Kaluzienski, S. S. Holt, E. A. Boldt, and P. J. Serlemitsos Jul. 1976 27 p refs Submitted for publication
(NASA-TM-X-71139; X-661-76-142) Avail: NTIS HC $4.00 CSCL 03A

The All-Sky X-ray Monitor onboard Ariel 5 has observed the 3-6 keV decline of the bright transient X-ray source A0620-00 on a virtually continuous basis during the period September 1975 - March 1976. The source behavior on timescales > 100 minutes is characterized by smooth, exponential decays interrupted by substantial increases in October and February. The latter increase was an order-of-magnitude rise above the extrapolated exponential fall-off, and was followed by a final rapid decline. Upper limits of 2.5% and 10% were found for any periodicities in the range 0d.2 - 10d during the early and later decay phases, respectively. A probable correlation between the optical and 3-6 keV emission from A0620-00 was noted, effectively ruling out models involving traditional optical novae in favor of Roche-lobe overflow in a binary system. The existing data on the transient

X-ray sources is consistent with two distinct luminosity-lifetime classes of these objects. Author

N76-28121*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIATIONS IN THE SPECTRA AND PULSE PERIOD OF GX301-2
J. H. Swank, R. H. Becker, E. A. Boldt, S. S. Holt, S. H. Pravdo, R. E. Rothschild, and P. J. Serlemitsos Jun. 1976 16 p refs Submitted for publication Prepared in cooperation with Md. Univ.
(Grant NGR-21-002-316)
(NASA-TM-X-71137; X-661-76-117) Avail: NTIS HC $3.50 CSCL 03A

Spectra from observations of GX301-2 (3U1223-62) by the Goddard X-ray spectroscopy experiment on OSO-8 show an absorption edge due to cool iron with column densities of a few x 10 to the 19th power/cm squared. A decrease in intensity was associated with increased absorption and a spectrum similar to those of binary X-ray sources in absorption dips. Observed variations of the pulse period are consistent with Doppler shifts for reasonable orbit parameters. Author

N76-28122*# Kanner (Leo) Associates, Redwood City, Calif.
OPTICAL OBSERVATIONS FROM THE VOSKHOD-2 SPACECRAFT
A. I. Lazarev and Ye V. Khrunov Washington NASA 30 Jun. 1976 52 p refs Transl. into ENGLISH from the book "Opticheskiye Nablyudeniya s Kosmicheskogo Korablya Voskhod-2" Leningrad, Hydrometeorological Press, 1975 p 1-38
(Contract NASw-2790)
(NASA-TT-F-17074) Avail: NTIS HC $4.50 CSCL 03A

Based on visual observations and photography by Soviet and American astronauts, as well as on color pictures painted aboard Voskhod-2, the solar corona, Fresnel reflection of the sun from the atmosphere of the earth and from comet Kohoutek, and noctilucent clouds on the night side of the earth are discussed and analyzed. The possibilities of the study of Fresnel reflection of the sun from the atmosphere of Venus and of observation of Fresnel reflections of the stars and planets from the nighttime atmosphere of the earth are discussed. Author

N76-28123*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HEAO BLOCK 2 STUDY EXECUTIVE SUMMARY
Mar. 1976 41 p
(NASA-TM-X-73318) Avail: NTIS HC $4.00 CSCL 03A

An executive summary is presented of a preliminary study done on several potential High Energy Astronomy Observatory (HEAO) missions which are follow-on missions to the currently defined HEAO program. The purpose was to examine several typical missions and determine the relative complexities associated with them. The four payloads investigated were (1) a 1.2 m Diameter X-ray Telescope observatory, (2) a Large Area Moderate Angular Resolution (LAMAR) observatory, (3) a cosmic ray observatory, and (4) a gamma ray observatory. Each of the four observatories was considered a national facility. Low cost approaches were stressed throughout, with considerable use of HEAO Block I experience and designs effected to provide a high degree of confidence that such approaches were achievable. The use of the Multi-Mission Spacecraft (MMS) and the HEAO Block I spacecraft was considered as a result of this low cost emphasis. Also, NASA standard components were considered, where applicable. Author

N76-28124*# Joint Publications Research Service, Arlington, Va.
RADIOPHYSICAL INVESTIGATIONS OF THE MOON AND THE PLANETS
N. N. Krupenio Washington NASA Jul. 1976 58 p Transl. into ENGLISH of "radiofizicheskiye issledovaniya luny i planetii" Moscow, Znaniye Press, 1976 p 1-64
(NASA Order W-13183)
(NASA-TT-F-17062) Avail: NTIS HC $4.50 CSCL 03A

Current methods for terrestrial investigation of the moon and the planets in the radio range are discussed. Results of radio astronomy and radar measurements of the physical parameters of these objects in the solar system are presented. Author

N76-28125*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PHOTOMETRIC STUDY OF THE ORION OB 1 ASSOCIATION. 1: OBSERVATIONAL DATA
Wayne H. Warren, Jr. and James E. Hesser Jun. 1976 161 p refs Submitted for publication
(NASA-TM-X-71151) Avail: NTIS HC $6.75 CSCL 03B

An extensive catalog of observational data is presented for stars in the region of the young stellar association Orion OB 1. In addition to new photoelectric observations obtained on the uvbyB and UBV systems, photoelectric and spectroscopic data were compiled for the stars observed and for several bright members of the association having available photometric indices. Mean weighted values were computed for the uvbyB and UBV data and are tabulated in summary tables which include all references for individual values. These tables are expected to be reasonably complete for association members earlier than spectral type A0. From an analysis of currently available proper motion, radial velocity, and photometric data, membership criteria were derived and qualitative membership probabilities for 526 stars were summarized. A set of charts is included for assistance in identification of the program stars in all regions of the association. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N76-28126 Colorado Univ., Boulder.
THEORY AND OBSERVATIONS OF INTERFEROMETER VISIBILITY SCINTILLATIONS WITH APPLICATION TO THE INTERPLANETARY MEDIUM Ph.D. Thesis
Robert Lucien Mutel 1975 172 p
Avail: Univ. Microfilms Order No. 76-11598

Turbulence in the interplanetary and interstellar media causes fluctuations both in phase and amplitude of a propagating electromagnetic wave. The fluctuations can be used to deduce properties of the turbulence, as well as of the source of radiation. The Rytov approximation to the wave equation was used to develop the relationship between interferometer visibility scintillations and the spatial spectrum of a turbulent medium with slowly varying bulk velocity and strength. A realistic three-dimensional model of the interplanetary medium was considered using numerical techniques. The relative orientation of the baseline and bulk velocity vectors can be used to measure anisotropy of the irregularities. A very-long-baseline interferometer experiment was performed to measure the irregularity spectrum of the interplanetary medium. Dissert. Abstr.

N76-28127 Ohio State Univ., Columbus.
GEOMETRODYNAMICS OF A HOMOGENEOUS ASYMMETRIC STAR IN FREE-FALL GRAVITATIONAL COLLAPSE Ph.D. Thesis
Uday Kumar Sengupta 1975 238 p
Avail: Univ. Microfilms Order No. 76-10042

The mechanism of gravitational radiation associated with a homogeneous asymmetric star in free-fall collapse was investigated and identified. First order matter and metric perturbations inside the star are analyzed, classified and reformulated to allow a synthesis with the well-known first order Schwarzschild perturbations outside the collapsing star. A complete set of orthogonal basis tensor harmonics was constructed for the expansion of any symmetric rank-2 tensor field in a spherically symmetric homogeneous space-time and used to analyze and classify metric perturbations inside the collapsing star. The general asymmetries of the collapsing star are completely classified into five mutually exclusive classes, of which three have even parity and the other two have odd parity. All properties of interior gravitational waves are contained in a single new scalar wave equation. The form of this equation is the same for both odd and even parity gravitational waves. Dissert. Abstr.

N76-28128 New York Univ., N.Y.
A MODEL FOR THE GALACTIC H I DISTRIBUTION Ph.D. Thesis
Maurice Reifman 1975 159 p
Avail: Univ. Microfilms Order No. 76-10214

Considered is an infinitely conducting rotating gas disc of finite thickness subject to an external gravitational field. Once the rotation curve was specified, two solutions were found to the hydromagnetic equations. For the first solution rigid rotation was assumed, for the second, each stream surface rotation of the magnetic field at different speed. The two undetermined functions of the solution are chosen linear so that the differential equation remains linear. With a choice made for the rotation curve and with the gas density prescribed, the magnetic field and star distribution are expressed in Bessel-cosine series in a two parameter model. Dissert. Abstr.

N76-28129 Pennsylvania Univ., Philadelphia.
PULSARS FROM SUPERNOVAE Ph.D. Thesis
Roger David Hand Warburton 1975 147 p
Avail: Univ. Microfilms Order No. 76-12358

It is shown how the "Carbon Detonation" phenomenon may be avoided. It is possible for gravitational collapse to set in before detonation takes over. The stability of the degenerate cores of Red Giant stars in which some carbon burning has taken place is affected by both electron capture and the changes in stellar composition. The change in the value of mu = A/Z from these effects causes a density discontinuity and alters the stability of the star. Stellar evolution up to the carbon burning phase is discussed along with the advantages and disadvantages of gravitational collapse and carbon detonation. Emphasis is placed on the inability of detonating stars to leave pulsar remnants. Numerical techniques for treating density discontinuities, equations of state, general relativistic structure, and pulsation equations were established. An analytical method for predicting mass and moment of inertia peaks was also developed and applied to published equations of state for neutron stars. Dissert. Abstr.

N76-28130 California Inst. of Tech., Pasadena.
SOFT X-RAYS FROM THE LARGE MAGELLANIC CLOUD AND THE GALAXY, IMPLICATIONS ON THE ORIGIN OF THE DIFFUSE X-RAY BACKGROUND Ph.D. Thesis
Knox Stedman Long, Jr. 1976 188 p
Avail: Univ. Microfilms Order No. 76-13134

Observations of Southern Hemisphere X-ray sources are reported, obtained by two attitude-controlled sounding rocket experiments launched from Woomera, Australia on 1 and 8 November 1973. The X-ray luminosity of the Large Magellanic Cloud was observed to be 10 to the 38th power ergs/s between 0.4 and 1.5 keV. An upper limit on the extragalactic diffuse X-ray flux of 250 photons/sq cm s keV sr at 0.215 keV was derived, based on the lack of modulation of soft X-rays by neutral interstellar matter in the direction of the Large Magellanic Cloud. Spectra of three extended soft X-ray regions are reported. Two of the regions, in Eridanus and in Gemini-Monoceros, are of Galactic origin. The third lies in a direction of very low neutral hydrogen column density and hence its spatial origin cannot be unambiguously established. The volume emissivity required in Galactic enhanced regions does not differ greatly from what is required to generate the soft X-ray background. Dissert. Abstr.

N76-28131 California Inst. of Tech., Pasadena.
RAPID NUCLEAR REACTIONS IN TURBULENT CONVECTION AND THE HELIUM-SHELL FLASH INSTABILITY Ph.D. Thesis
Keith Howard Despain 1976 172 p
Avail: Univ. Microfilms Order No. 76-13132

The physical character of convection in red giants is discussed. It is pointed out that the convection is generally highly turbulent, based on mixing length velocities and scales. The diffusion approximation to convective mixing is discussed and the effective diffusion coefficient for mixing was developed. The weaknesses in the approximation are pointed out. The development of steep abundance gradients in highly reactive convective regions is demonstrated. Numerical techniques for solving convective reaction networks are discussed. Light element reactions network calculations in deeply mixed and hot-bottom convective red giant envelopes are presented. The onset, development, and quenching of the helium-shell flash is discussed. Physical explanations for some of the features of shell flashes are given. Numerical experiments are presented to support the argument that the flash is quenched by thermal processes rather than by hydrostatic readjustment directly. It is proposed that the flash is quenched when the entire star adjusts to the thermal pulses reaching the hydrogen shell by radiative diffusion from the unstable helium shell. Dissert. Abstr.

N76-28132*# South Carolina Univ., Columbia.
INFRARED SPECTRA OF MOLECULES AND MATERIALS OF ASTROPHYSICAL INTEREST Quarterly Progress Report, 15 Mar. - 15 Jun. 1976
James R. Durig Jun. 1976 85 p refs
(Grant NGL-41-002-003)
(NASA-CR-148292; QPR-36) Avail: NTIS HC $5.00 CSCL 03B

The vibrational spectra from 4,000 to 33/cm of several molecules which may be present in the atmosphere of the Jovian planets or exist in outer space were studied. These studies have been made to provide vibrational frequencies which can be used to: (1) determine the composition of the cloud covers of several of the planets, (2) provide structural information under favorable circumstances, (3) provide necessary data from which accurate thermodynamic data can be calculated, and (4) furnish information as to the nature of the potential energy function of the molecules and forces acting within them. Some of the molecules studied can be produced photochemically from methane, ammonia, and hydrogen sulfide which are thought to be constituents of the planets with reducing atmospheres. Some of the compounds will polymerize under ultraviolet radiation and drop out of the atmospheres. However, planets with a hot base, like that of Jupiter, may rebuild molecules destroyed photochemically. These criteria were used in selecting the compounds under study.
Author

N76-27269* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
ALSEP: QUASAR DIFFERENTIAL VLBI
M. A. Slade, R. A. Preston, A. W. Harris, L. J. Skjerve, and D. J. Spitzmesser *In its* The Deep Space Network 15 Jun. 1976 p 37-54 refs (For availability see N76-27262 18-12)
CSCL 03C

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N76-28133 State Univ. of New York, Buffalo.
THE INTERACTION OF GASES AND VAPORS WITH LUNAR BRECCIAS AND SOILS Ph.D. Thesis
Joseph Robert Stetter 1975 192 p
Avail: Univ. Microfilms Order No. 76-9122

The surface structure and chemistry of lunar soil and breccias were investigated using both volumetric and gravimetric adsorption techniques, helium pycnometry for absolute density determination, and scanning electron microscopy. Modification of the classical BET volumetric adsorption apparatus, coupled with special pycnometer design, results in the ability to acquire data which, when coupled with statistical analysis by computer, allow the calculation of absolute densities for these materials to within a precision of five percent. Standard BET volumetric nitrogen adsorption techniques for the determination of the surface area of samples are used to compare surfaces as a function of environmental exposure. Standard gravimetric techniques were used to measure the isotherms for water vapor on lunar breccia at 15 C. The water vapor isotherms were found to exhibit both physisorption and chemisorption phenomena. In conclusion, these measurements revealed that lunar breccia fragments and soils

exhibit an extensive pore structure not found in their terrestrial mineral analogs. Dissert. Abstr.

N76-28134 Washington Univ., St. Louis, Mo.
FISSION TRACK STUDIES OF Pu-244 IN WHITE INCLUSIONS OF THE ALLENDE METEORITE Ph.D. Thesis
James Richard Shirck 1975 185 p
Avail: Univ. Microfilms Order No. 76-14085

Pu-244/U-238 ratios were measured in individual melilite and clinopyroxene grains from six coarse grained white inclusions of the Allende carbonaceous chondrite. Fission tracks attributable to Pu-244 were found in both melilite and clinopyroxene in all six inclusions. From one inclusion to another, the Pu-244/U-238 ratios were relatively uniform in clinopyroxene. Ratios in the melilite were much more variable from one inclusion to another. The track annealing data and track length distributions suggest that variations in the Pu-244/U-238 ratios are not due to thermal annealing of fossil Pu-244 fission tracks but rather to chemical fractionation of Pu and U. The results confirm the primitive nature of the white inclusions and show that Pu-244 was incorporated into the minerals of the inclusions at the time they formed. Dissert. Abstr.

N76-28135*# McDonald Observatory, Austin, Tex.
REPORT ON THE LUNAR RANGING AT MCDONALD OBSERVATORY, 1 FEBRUARY - 31 MAY 1976
C. S. Palm and J. R. Wiant Jun. 1976 46 p ref
(Grant NGR-44-012-165)
(NASA-CR-148132; RM-76-004) Avail: NTIS HC $4.00 CSCL 03B

The four spring lunations produced 105 acquisitions, including the 2000th range measurement made at McDonald Observatory. Statistics were normal for the spring months. Laser and electronics problems are noted. The Loran-C station delay was corrected. Preliminary doubles data is shown. New magnetic tape data formats are presented. R and D efforts include a new laser modification design. Author

N76-28136*# Kanner (Leo) Associates, Redwood City, Calif.
FIRST PICTURES OF THE SURFACE OF VENUS (PRELIMINARY ANALYSIS)
A. P. Vinogradov, K. P. Florenskiy, A. T. Bazilevskiy, and A. S. Selivanov Washington NASA Jun. 1976 10 p refs Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 2, no. 2, Feb. 1976 p 67-71
(Contract NASw-2790)
(NASA-TT-F-15487) Avail: NTIS HC $3.50 CSCL 03B

Venera-9 and Venera-10 pictures of the surface of Venus were obtained by panoramic phototelevision cameras (scanning telephotometers) with an angular resolution of 1/3 deg from a viewing point about 1 m above the surface. The panoramic axis of the telecamera is slanted downward and forms an angle of approximately 40 deg with the vertical axis. The total panoramic field is about 40 x 180 deg. The pictures and illumination conditions are described, taking into account the imaging system characteristics. Particular geological and morphological features are analyzed and discussed. The rock at the landing sites can, in terms of its radioactivity (corresponding to terrestrial basals), density (determined by a gamma densitometer), and by overall habitus, be classified as basaltoid. The nature of the stony surface detected at two random sites on Venus also agrees with the average density value (2.3 + or - 0.4 g/cu cm) obtained by radar measurements. Therefore, it can be considered typical of the Venus surface. Author

N76-28137*# Scientific Translation Service, Santa Barbara, Calif.
CHARACTERISTICS OF THE VENUS SURFACE MEASURED BY RADIOALTIMETER IN THE LANDING AREA OF THE VENERA-8 DESCENT MODULE
M. V. Vashmashnikov, V. T. Guslyakov, V. M. Yeshskov, V. V. Kerzhanovich, M. L. Namalovich, and Ye. Ye. Tseymlin Washington NASA Jun. 1976 10 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 14, no. 1, Jan.-Feb. 1976 p 111-114
(Contract NASw-2791)
(NASA-TT-F-17023) Avail: NTIS HC $3.50 CSCL 03B

It is shown how the radioaltimeter signals of the Venera-8 descent module telemetered to Earth were used to determine local Venus surface characteristics (in the vicinity of the landing site). Albedo, dielectric constant, and density of the surface layer of the planet were studied. The necessary mathematical relationships are included. The following data were obtained: 0.07 and 0.09 for albedo, 3.2 + or - 1.3 for dielectric constant, and 1.4 + or - 0.55 g/cu cm for density. The radiometric altitude measurements agree well with altitude data and with the atmospheric temperature and pressure measurements, particularly at altitudes under 20 km. The operational peculiarities of the radioaltimetric measurements and their relationship to surface features are discussed. Author

N76-28138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ENVIRONMENT OF TITAN, 1975 NASA Space Vehicle Design Criteria (Environment)
Jul. 1976 45 p refs
(NASA-SP-8122) Avail: NTIS HC $4.00 CSCL 03B

Information regarding the physical characteristics of Titan and atmospheric models necessary to support design and mission planning of spacecraft that are to orbit Titan, enter its atmosphere or land on its surface is given. Author

N76-28139*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SURFACE CHEMISTRY OF SELECTED LUNAR REGIONS
Michael J. Bielefeld (Computer Sciences Corp., Silver Spring, Md.), Robert C. Reedy (Los Alamos Sci. Lab., N. Mex.), Arnold E. Metzger (Jet Propulsion Lab., Pasadena, Calif.), Jacob I. Trombka, and James R. Arnold (Univ. of Calif., San Diego, Calif.) Jun. 1976 32 p refs
(NASA-TM-X-71157; X-682-76-149) Avail: NTIS HC $4.00 CSCL 03B

A completely new analysis has been carried out on the data from the Apollo 15 and 16 gamma ray spectrometer experiments. The components of the continuum background have been estimated. The elements Th, K, Fe and Mg give useful results; results for Ti are significant only for a few high Ti regions. Errors are given, and the results are checked by other methods. Concentrations are reported for about sixty lunar regions; the ground track has been subdivided in various ways. The borders of the maria seem well-defined chemically, while the distribution of KREEP is broad. This wide distribution requires emplacement of KREEP before the era of mare formation. Its high concentration in western mare soils seems to require major vertical mixing. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N76-28140# Academy of Sciences (USSR), Moscow. Space Research Inst.
ELECTRON TEMPERATURE RADIAL DISTRIBUTION IN SOLAR WIND AND SOLAR WIND MODEL
K. I. Gringauz and M. I. Verigin 1975 26 p refs
(D-218) Avail: NTIS HC $4.00

Available models for the solar wind are briefly reviewed. The plasma electron component experiment carried out onboard the Mars 3 probe is described, and the results of electron temperature measurements are compared to those obtained from solar wind models. A discrepancy is found, and a mechanism for the decrease of electron heat conductivity is proposed. ESA

N76-28141# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
ON THE PROPAGATION OF LOW ENERGY SOLAR PROTONS IN THE INTERPLANETARY MEDIUM
E. Amata, V. Domingo, D. E. Page, and K.-P. Wenzel 1975 6 p refs Presented at the 14th Intern. Cosmic Ray Conf., Munich, 15-29 Aug. 1975
Avail: NTIS HC $3.50

The fluxes and anisotropies of low energy solar protons (less than 10 MeV) observed on two occasions when the HEOS-2 spacecraft encountered solar proton streams are studied taking into account the interplanetary magnetic field and plasma

conditions existing at those times. (Plasma and magnetic field measurements are available from the same satellite). The variations in the streaming pattern are used to infer the topological structure of the interplanetary medium. The observed results are compared to existing models of particle propagation between the sun and the earth. Author (ESA)

N76-28142# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
A MODEL FOR U-SHAPED SOLAR BURST SPECTRA 2 Interim Report
Gabor Kalman Jul. 1975 28 p refs
(Contract F19628-72-C-0003; AF Proj. 4643)
(AD-A020321; AFCRL-TR-75-0416; Scientific-3) Avail: NTIS CSCL 03/2

Developments of the theoretical model of Kalman and Yukon of U-shaped solar burst spectra are discussed. The basic features of the model consisting of assigning both the low- and high-frequency positions of the radiation spectrum to the same group of mildly relativistic electrons, are reviewed. The main features of the single particle source spectrum are in qualitative agreement with those of observed spectra. Integration over the pitch-angle distribution of particles improves the qualitative agreement. The radiation emitted in the dense source region is guided by a magnetic loop into the less dense coronal regions, where it is converted by incoherent scattering on thermal dressed ions into free space electromagnetic radiation. Certain correlations suggested by the model have already been verified, others are proposed for eventual study. Author (GRA)

N76-28143# California Inst. of Tech., Pasadena.
COOPERATIVE STUDIES OF CHROMOSPHERIC STRUCTURE AND MAGNETIC FIELDS Final Report, 1 Oct 1972 - 30 Jun. 1975
H. Zirin and R. L. Moore 4 Sep. 1975 16 p refs
(Contract F19628-73-C-0085; AF Proj. 7649)
(AD-A020553; AFCRL-TR-75-0537) Avail: NTIS CSCL 03/2

This report concentrates on chromospheric phenomena and their associated magnetic fields. The following three areas of research are discussed: (1) Morphology of active regions, i.e. relations between magnetic field structure and plages, filaments, and flares; (2) Sunspot phenomena, especially umbral flashes and running penumbral waves; (3) Structure and dynamics of quiet regions, e.g. chromospheric network, spicules and oscillations. GRA

N76-27271* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Communications Elements Research Section.
DSS 14 OPERATING NOISE TEMPERATURE DURING HELIOS 1 NEAR-SUN TRACKING
C. T. Stelzried and D. Girdner *In its* The Deep Space Network 15 Jun. 1976 p 68-76 refs (For availability see N76-27262 18-12)
CSCL 03B

N76-27281* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Network Operations Section.
DOPPLER NOISE CONSIDERED AS A FUNCTION OF THE SIGNAL PATH INTEGRATION OF ELECTRON DENSITY
A. L. Berman and J. A. Wackley *In its* The Deep Space Network 15 Jun. 1976 p 159-193 refs (For availability see N76-27262 18-12)
CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N76-28144 New Hampshire Univ., Durham.
A MATHEMATICAL MODEL OF INTERPLANETARY RADIO SCINTILLATION, IN THE WEAK-SCATTERING REGIME Ph.D. Thesis
Donald Grant Mitchell 1975 80 p
Avail: Univ. Microfilms Order No. 76-11683

Interplanetary scintillations were modeled under the assumption of a power-law electron density fluctuation power spectrum. The model provides the means for quickly interpreting large quantities of data, even on a real time basis. An analytic expression is first found for the integral expression for the weak-scattering power spectrum from a thin slab of the medium. This expression is then approximated with a maximum error of 10%. The thin slab result is integrated numerically through the medium along the line of sight to a radio source, thus building up the extended medium spectrum. Further results include the zeroth and second moments of the spectrum, as functions of sun-earth-source angle (elongation angle) for a quiet interplanetary medium. Fits to published and unpublished data are presented, which indicate a power-law index of 3.2-3.6, and are interpreted in terms of solar wind velocity, density profile, and source angular scale. Dissert. Abstr.

N76-28145 Florida Univ., Gainesville.
RADIO SPECTRAL LINE STUDIES OF THE INTERSTELLAR MEDIUM IN THE GALACTIC PLANE Ph.D. Thesis
Andrew Wilkin Seacord, II 1975 245 p
Avail: Univ. Microfilms Order No. 76-12127

A model was developed for the source of radio recombination line emission from the galactic plane. The model is based mainly on recombination line spectra observed in the direction of the supernova remnant 3C391. The H157 alpha recombination line was used with the H92 alpha spectrum to obtain a model consistent with both spectra. Other criteria were also considered. The models studied included: a cold region illuminated by 3C391; an isolated cold region; a group of hot, dense H II regions; and a low density H II nebula. The H157 alpha spectrum in the direction of the pulsar 1858+03 was also observed. It was found that one of the recombination line nebulae probably lies along the line of sight to the pulsar, which would be at a distance of 2.6 kpc. The large scale distribution of the H II nebulae was also studied. Results suggest that they exist within an annular region from 4 to about 8.7 kpc from the galactic center. Dissert. Abstr.

N76-28146 State Univ. of New York, Stony Brook.
THE 350-MICRON PHOTOMETRY OF GALACTIC SOURCES Ph.D. Thesis
Giovanna Righini 1975 166 p
Avail: Univ. Microfilms Order No. 76-10623

The instrumental techniques and the atmospheric constraints of ground based submillimeter photometry are described. Emission mechanisms that are likely to be important in the submillimeter spectral region are analyzed in some detail. The observations show that: (1) all the sources which have been observed have in common a steep spectral dependence on wavelength in the submillimeter; this strongly supports the idea that emission is due to optically thin thermal radiation of dust, (2) a strong spatial correlation exists between regions of molecular emission and regions of submillimeter radiation, indicating that the thermal radiation arises from dust within these regions, and (3) the correlation between submillimeter emission and the molecular clouds is shown to be more explicit by a direct correlation between submillimeter optical depths and molecular column densities. Dissert. Abstr.

N76-28147*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA-RAYS, COSMIC RAYS, AND GALACTIC STRUCTURE
F. W. Stecker Jun. 1976 36 p refs Presented at Intern. and Gamma-Ray Symp. on the Struct. and Content of our Galaxy and Galactic Gamma-Ray, Greenbelt, Md., 2-4 Jun. 1976 Submitted for publication
(NASA-TM-X-71138; X-602-76-148) Avail: NTIS HC $4.00 CSCL 03B

The relation of SAS-2 observations of galactic gamma-rays to the large scale distribution of cosmic rays and interstellar gas in the galaxy is reviewed. Starting with a discussion of production rates, the case for pion decay being the predominant production mechanism in the galactic disk above 100 MeV is reestablished, and it is also pointed out that Compton gamma-rays

can be a significant source near l = 0. The concepts of four distinct galactic regions are defined, viz. the nebulodisk, ectodisk, radiodisk and exodisk. Bremsstrahlung and pion decay gamma-rays are associated with the first two (primarily the first) regions, and Compton gamma-rays and synchrotron radiation are associated with the latter two regions. On a large scale, the cosmic rays, interstellar gas (primarily H2 clouds in the inner galaxy) and gamma-ray emissivity all peak between 5 and 6 kpc from the galactic center. This correlation is related to correlation with other population I phenomena and is discussed in terms of the density wave concept of galactic structure.
Author

N76-28148*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REANALYSIS OF THE APOLLO COSMIC GAMMA-RAY SPECTRUM IN THE 0.3 TO 10 MeV ENERGY REGION
J. I. Trombka, C. S. Dyer (Maryland Univ., College Park), L. G. Evans (Computer Sciences Corp., Silver Spring, Md.), M. J. Bielefeld (Computer Sciences Corp., Silver Spring, Md.), S. M. Seltzer (NBS, Gaithersburg, Md.), and A. E. Metzger (JPL) Jun. 1976 36 p refs
(Contract NAS7-100)
(NASA-TM-X-71150; X-682-76-128) Avail: NTIS HC $4.00 CSCL 03B

Additional data obtained from the Apollo-16 and -17 missions, together with collateral calculations on background radiation effects, have enabled an improved subtraction of unwanted backgrounds from the diffuse cosmic gamma-ray data previously reported from Apollo-15. As a result, the 1- to 10-MeV spectrum is lowered significantly and connects smoothly with recent data at other energies. The inflection reported previously is much less pronounced and has no more than a 1.5-sigma significance. Sky occultation by the Apollo-16 spacecraft shows the bulk of the 0.3- to 1-MeV radiation to be diffuse. The analysis of spurious backgrounds points to important improvements for future experiments designed for this spectral region. Author

N76-28149# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
RESEARCH PROGRESS IN AIRBORNE SURVEYS OF TERRESTRIAL GAMMA RADIATION
Z. G. Burson, Comp. 4 Jun. 1974 30 p refs
(Contract AT(29-1)-1183)
(EGG-1183-1631) Avail: NTIS HC $4.00

Progress during the last few years in airborne surveys of terrestrial gamma radiation, i.e. in the measuring, recording, and interpreting of gamma ray signals in NaI(Tl) crystals, is discussed. Non-terrestrial background contributions have been accurately characterized. The feasibility of determining the water equivalent of snow cover by aerial survey techniques has been demonstrated. Repeat surveys over areas surrounding reactor sites can now be used to detect average differences of less than 1.0 mu R/hr in terrestrial gamma radiation levels. New data acquisition and recording systems allow isotope concentrations and total inventories to be measured in spatial resolutions of a few hundred feet. Aerial survey data have been combined with population distribution data to obtain population exposure values from natural terrestrial gamma radiation around reactor sites. Author (ERA)

N76-28150# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
PHOTOELECTRON DISTRIBUTION DETERMINATION FROM PLASMA LINE INTENSITY MEASUREMENTS OBTAINED AT NANCAY (FRANCE)
G. Lejeune and W. Kofman 5 Nov. 1975 49 p refs Submitted for publication
(CEPHAG-48/75) Avail: NTIS HC $4.00

A new model energy distribution derived from plasma line measurements is proposed for application to the plasma oscillations observed by the French incoherent scatter systems at Nancay. The plasma oscillations have small phase velocities and are excited by photoelectrons of energy between 2 and 5 eV. The parameters of the model are explained; results show that the photoelectron flux can be adequately derived from plasma line intensity measurements. ESA

N76-28151# Owens Valley Radio Observatory, Pasadena, Calif.
ACCURATE POSITIONS OF OH EMISSION SOURCES
N. J. Evans, II, Richard M. Cruther, and W. J. Wilson (Aerospace Corp., El Segundo, Calif.) 1976 12 p refs
(Contract N00014-67-A-0094-0019; Grant NSF GP-30400)
(AD-A020806; Rept-1976-1) Avail: NTIS CSCL 03/2

The Owens Valley interferometer has been used to measure accurate positions for 9 OH emission sources at 1,612 MHz and 4 sources at 1,665 MHz. The baseline was 244 meters north-south. In addition to the very strong 1612 emitter, OH26.5-0.6, 8 sources from the survey of Winnberg et al. (1973) were measured. These positions have been used in a search for infrared objects (results presented elsewhere). In addition, a position was measured for the 1665 maser emission from IC2162 (S255) and the position of the maser in W75N was remeasured. GRA

99 GENERAL

N76-28152# Ruhr Univ., Bochum (West Germany).
[RESEARCH ACTIVITIES AT THE RUHR UNIVERSITY, BOCHUM] Annual Report, 1974 [FORSCHUNGSBERICHT 1974]
1975 538 p refs In GERMAN
Avail: NTIS HC $13.00

Activities in the space field at the Department of Physics and Astronomy cover theoretical cosmic plasma physics, Milky Way astronomy and extraterrestrial physics (mainly interplanetary dust). ESA

N76-28153# European Space Agency, Paris (France).
TECHNICAL AND POLITICAL PROBLEMS OF EUROPEAN SPACE RESEARCH
R. Gibson 1975 5 p Presented at the Telecom 75, Geneva, 6-8 Oct. 1975
Avail: NTIS HC $3.50

An historical survey of the problems of European space research is presented. Problems mentioned are fair return to countries participating in space programs, short-term national interests, and underlying nationalism. ESA